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A Study Of Human Gender Classification And Its Application Using Artificial Neural Network Method

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Abstract - This study show how an artificial neural network technique was used to create a system capable of recognizing a person based on their face. This system is comprised of two phases of implementation. The testing stage and the learning stage are the two stages. Image acquisition, pre-processing, image filtering, feature extraction, and learning are all steps in the learning stage. The system begins by capturing a person's image. The input image is converted to grayscale after high pass filtering and edge detection, and the position of the face is determined from the image. The image's features and grey levels are extracted and represented as a feature matrix in order to feed the Kohonen self-organizing map with information. The unsupervised learning network is trained and builds a knowledge base in order to be used in the future.

I. INTRODUCTION

Human face image analysis is a important area of research in pattern recognition and computer vision. Many researchers are working on developing new algorithms or improving existing ones for a variety of face perception tasks such as face recognition, age classification, gender recognition, and so on. Closer to home, a face image can reveal a lot about your identity, expression, emotions, gender, race, age, and so on. Human facial image processing research is still active and interesting in many directions. Age estimation and gender separation from face images are important components of many computer vision-based applications, such as parental controls for websites, video services, and shopping recommendation systems.

The problem of facial recognition is both interesting and pervasive today due to the wide range of popular real-world applications for facial recognition, including biometrics, security control, cosmetology, and entertainment. Our social lives, in which we rely on the two facial characteristics for daily interactions, have seen a rapid increase in the age and gender classification of faces in particular.

Many different approaches to classifying people by age and gender have been tried, but many of them fail to solve the problems correctly. Most popular methods are handcrafted, which means that the features of the face are added one at a time. The methods concentrate on extracting handcrafted features in order to locate the information required for the estimation task. Many researchers investigated various machine learning methods for determining a person's age and gender. These methods, however, were only effective for face images taken under controlled

conditions. Few of these methods were designed to deal with the many challenges of imaging in the real world, resulting in unsatisfactory results.

Background

Face recognition research predates computer vision because of its practical importance and theoretical interest from cognitive scientists. Face recognition has always been a major focus of research due to its non-invasive nature and the fact that it is people's primary method of person identification, despite the fact that other methods of identification (such as fingerprints or iris scans) can be more accurate in some cases. Much of the work in computer recognition of faces has been devoted to identifying individual features such as the eyes, nose, mouth, and head outline in order to define a face model by the position, size, and relationships between these features. Such methods have been difficult to adapt to various points of view and are typically highly fragile, demanding a credible first estimate to guide them. Further research into human face recognition techniques has revealed that adult human face identification performance cannot be explained by individual features and their close relationships. However, in the computer vision literature, this method of face recognition remains the most extensively utilized.

Application of Face Recognition System

A broad range of uses exist for person identification systems. Examples comprise:

Automatic Face Recognition

Automatic face recognition has already been used in

- Personal identification (credit cards, driver's license, passports, employee ID)
- Access control, such as the access to check-cashing ATMs, buildings or rooms).

Video Coding, Video Databases and Teleconferencing System

It is well known that people are most sensitive to coding errors in facial features. The coder would

- Encode very precisely facial features (such as eyes, mouth, nose, etc.)
- Encode less precisely the rest of the picture.

Human-Computer Interaction

Currently some computer games can be played with head movement, instead of mouse or keyboard (but the player must wear headgear).

Security Monitoring

A face tracking system can be used as a security system in shopping malls, other public areas, or private houses.

Banking System

In banking system, human face detection system is much used phenomenon.

Information Retrieval

For information retrieval system human face detection is very important things.

Block Diagram of Testing Process

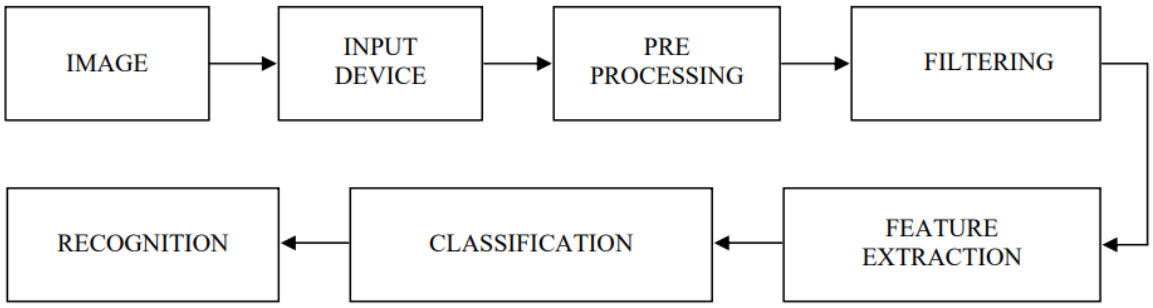

Figure 1: Recognizing Process

2. LITERATURE REVIEW

Ito, K., Kawai, H. et al,(2018) In this paper, we suggested a method for employing convolutional neural networks (CNNs) to predict age and gender based on facial photos. Within the study, we dove into topics like CNN architectures, regression/classification, STL/DMTL. When compared to other designs, WideResNet shows the best performance when predicting age and gender. When it comes to estimating age via regression and estimating gender via classification, WideResNet excels.

Bhat, S. F., & Dar, T. A. (2019) With the rise of social media platforms and online communities, automating the process of determining a person's age from a photograph is a task that is both crucial and challenging, with great promise in a wide range of legitimate applications. Extremely high demand has been seen for systems of positive facial feedback that can be used to counteract harmful actions and mental abuse.

Sumi, T. A., Hossain, M. S. et al,(2021) Human gender detection is a subset of facial recognition that has attracted a lot of attention recently due to the wide range of potential applications in the field. Many studies have been done on the topic of gender identity, and each of them has focused on a single static physical characteristic, such as the form of the face, eyebrow, hand, physique, fingernail, etc.

Rothe, R., Timofte, R. et al,(2018) We offer the largest publicly available collection of face photographs from the IMDB-WIKI database that have been labeled with ages and sex labels, and we describe a deep learning strategy for age prediction from a single face image. The study of apparent age estimate, or the age as perceived by other people from a face image, is a more new activity in comparison to the decades of work on real age estimation.

3. METHODOLOGY

An Artificial Neural Network (ANN) is a A data processing approach inspired by how the brain and other biological nervous systems function The most important feature of this paradigm is its new information processing system structure. It is made up of many interconnected processing units called neurons that work together to solve problems. ANNs, like humans, learn from what they observe. Through a learning process, an ANN is trained to perform a specific task, such as pattern recognition or data sorting. Learning occurs in biological systems when the synaptic connections between neurons change.

Artificial Neural Networks are viewed as the computing wave of the future. They are, in fact, self-learning systems that do not require traditional programming skills. Unfortunately, some misinformation has spread. Writers have made it sound as if these neuron-based processors can do almost anything. Because of these false claims, some would-be users have been disappointed when they attempted and failed to use neural networks to solve their problems. These app developers frequently conclude that neural nets are difficult to understand and complicated. Computers struggle to recognize even simple patterns, let alone use past patterns to predict what will happen in the future.

Because of advances in biological research, the mechanism of natural thinking may now be partially understood. According to this research, the brain stores information in the form of patterns. Some of these patterns are extremely complex, allowing us to recognize specific faces from a variety of angles. This method of storing information as patterns, using those patterns to solve problems, and so on introduces a new area of computing. As previously stated, this field does not use traditional programming but rather involves the construction of extremely parallel networks and the teaching of those networks to solve specific problems. Furthermore, words used in this field are very different from those used in traditional computing, such as behave, react, self-organize, learn, generalize, and forget.

Fundamental of Digital Image

The value of f at any point (x, y) is proportional to the brightness (or gray level) of the image at that point. A monochrome image, or simply an image, is a two-dimensional light intensity function f (x, y), where x and y are spatial coordinates.

A digital image is one that has spatial coordinates as well as brightness. A digital image can be thought of as a matrix, where the row and column numbers represent a point in the image and the value of the element in the matrix represents the gray level at that point. Image elements, picture elements, pixels, or pels are the elements of a digital array like this. The terms "pixels" and "pels" are frequently used as abbreviations for "picture elements."

Representation of a Digital Image

An image function f x, y must be digitized both spatially and in amplitude in order to be suitable for computer processing. Image sampling refers to digitizing the spatial coordinates (x, y), while gray-level quantization refers to digitizing the amplitude. Assume that an N M array of equally spaced samples is used to approximate the continuous image f x, y, where each form of the array represents a discrete quantity, as shown in given eqn below:

$$f(x,y)=\begin{bmatrix} f(0,0) & f(0,1) & . & f(0,M-1) \\ f(1,0) & f(1,1) & . & f(1,M-1) \\ . & . & . & \\ f(N-1,0) & f(N-1,1) & & f(N-1,M-1) \end{bmatrix}$$

Image Acquisition

The method of image acquisition is primarily determined by the type of input device (TWAIN driver), such as a digital camera, scanner, digitizer, and so on. However, the most versatile tools for this job are a digital camera or an image scanner. A scanner and a digital camera are used for almost all of this research. Digital camera - Prolink dual mode USB camera and scanner - Cannon 300F (2400 dpi). When scanning images with a scanner, the dpi is set to 100, and when taking pictures with a camera, the resolution is set to 320240. JPEG (*jpg, *jpeg) is the file format in which the file is saved. A JPEG file contains enough information about a color face. It is a compressed file format that will suffice for the research. A simple process known as "scanning" converts an image into a digital picture. The image is now on the computer as a result of the conversion. When an image is saved in JPEG format on a disk, it is simple to convert it to binary format. Image acquisition is a process that must be completed in a specific order. Those are mentioned below-

- Select the appropriate facial photograph which is to be scanned. It is recommended to use such a picture where face is highlighted.
- Place the photograph inside the scanner any where on the glass tray. Shut the cover of the scanner down.
- Set the appropriate parameters of the scanner for better performance of the learning and recognition process. That means the dpi, resolution, color mode etc.
- Operating by the driver, image is transferred to the computer. Save the image to its associated name. And the alternate provisions to acquire image through digital camera. The steps to acquire by this are follows:

4. CONCLUSION

For a long time, scientists have been attempting to develop a computer system capable of mimicking human behaviour. The system will be able to recognize objects visually, such as houses, offices, and cars, as well as audibly, such as people's faces, handwriting, and printed words. Computers, on the other hand, are better at repetitive tasks like adding up numbers with a few hundred digits than they are at processing the massive amounts of diverse types of data required by a vision system. Despite these obstacles, researchers are still attempting to develop artificially intelligent systems capable of recognizing general intelligence.

For more than 20 years, researchers have been researching the use of computers to recognize human faces. Unfortunately, because faces are complex, multidimensional visual stimuli, developing a computational model for face recognition is difficult. Face recognition is a difficult computer vision task that can entail a variety of primitive vision techniques. We develop an automated system to find neutral faces in images for face recognition. A neutral face is one in which the facial muscles are uncontracted and unmoving. The majority of the time, it is a person's face in its natural state, with no expression.

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