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To Analyze and Detect Gender by Using Convolution Neural Networks

B. Nagaraju[1]
[1]Asst.Professor -IT, NRI Institute of Technology, A.P, India-521212

A. Venkata Reddy[2]
[2]UG Scholar, Dept. of IT, NRI Institute of Technology, A.P, India-521212

T. Sri Manjunadha[3]
[3]UG Scholar, Dept. of IT, NRI Institute of Technology, A.P, India-521212

M. Mohan Kumar[4]
[4]UG Scholar, Dept. of IT, NRI Institute of Technology, A.P, India-521212

Abstract:- The project titled "GENDER CLASSIFICATION" predicts gender based on human bodies or behavior. In this paper, we have worked on a technique for classification of gender using python algorithm. Human classification and identification have been used for a very long period in many different fields. areas such as government identification cards, verification processes, etc. For the purpose of identifying people, we have already created methods such as the retinal scan, iris scan, fingerprint, and other complex systems like DNA fingerprinting. Despite the fact that these already developed methods are effective, the hardware, software, and human competency requirements are far too onerous for a number of straightforward tasks that may or may not call for professional efficiency. Technique reported in this paper is simple and easy for gender classification which can be performed using only a webcam and a decent computer system. Automatic gender classification has become relevant to an increasing number of applications, particularly since the rise of social platforms and social media. Even Nevertheless, compared to the enormous performance improvements recently reported for the closely related task of facial recognition, the performance of present approaches on real-world photographs still falls far short. In this paper, we demonstrate that performance on these tasks can be significantly improved by learning representations using deep convolutional neural networks (CNN). In order to do this, we suggest a straightforward convolutional net architecture that may be applied even with a finite supply of training data. We evaluate our method on the recent Audience benchmark for gender estimation and show it to dramatically outperform current state-of-the-art methods.

***Keywords*:-** *Convolution Neural Networks, Machine Learning, Python, Support Vector Machine.*

I. INTRODUCTION

In a real-time application based on face recognition today, gender classification is an extremely difficult task. Future trends will see a rise in demand for gender-based real-time applications. For feature extractors and classification, K-means clustering, Scale Invariant Fourier Transform, and Bag of Words (Bow) are employed. On several conventional datasets, this cutting-edge methodology produces results that are more effective. In this study, a brand-new method for automatically recognizing a person's gender in real time (GR) was proposed. The application of the work was evaluated for GR on the FEI, Live Images, and SCIEN databases. The detection rate in the FEI dataset, 94% in the Live/Own dataset, and 91% in the SCIEN dataset, respectively, went up to 98%, 94%, and 91%. This suggested cutting-edge approach. When this state-of-the-art methodology is compared to earlier methods, the results are superior, which will aid in the creation of real-time identification systems. Since gender provides rich and distinct information about male and female social activities, automatic gender classification is drawing more and more interest. The goal of gender classification is to identify a person's gender based on the traits that set masculinity and femininity apart. One of the most significant uses of the pattern recognition method in the field of artificial intelligence is the classification of gender. Human-computer interaction (HCI), the security and surveillance business, and mobile apps are just a few of the fundamental and practical research fields where a computer system with gender identification capabilities may be used. Additionally, other strategies are suggested to improve gender recognition in terms of precision and effectiveness. This is especially puzzling in light of recent assertions that superhuman powers exist in the related domain of facial recognition. Different measurements of facial features or "tailored" face descriptors have been used in the past to estimate or categories these properties from face photos. The majority have used categorization strategies like and others that were created especially for gender estimation tasks. Few of these earlier techniques were created to address the numerous difficulties presented by unrestricted imaging settings. Benchmark for identifying the gender of faces from the audience. Utilize the enormous amounts of image examples and data that are accessible via the Internet to

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enhance classification abilities. In this study, we make an effort to bridge the gap between automatic facial recognition technology and gender estimate techniques. In order to achieve this, we adopt the effective model set by current face recognition systems: Deep convolutional neural networks can be used to make significant advancements in face recognition algorithms, as demonstrated in recent years (CNN). We show comparable benefits using a straightforward network architecture that was created with the sparse availability of precise gender classifications in mind in existing face data sets. We put our network to the test using the just-released Audience benchmark for unfiltered facial image gender categorization. We demonstrate that our method surpasses the current state of the art by a wide margin, despite the extremely difficult nature of the photos in the Audience set and the simplicity of our network design. The difficulty of reliably determining gender in the unrestricted circumstances, as shown by the Adience photos, remains unsolved, even though these results offer a fantastic baseline for deep-learning-based systems. This is because they allow potential for development via more complex system designs. We release our trained models and categorization system to the public in order to give future methods a foundation on which to build.

II. TECHNOLOGIES USED

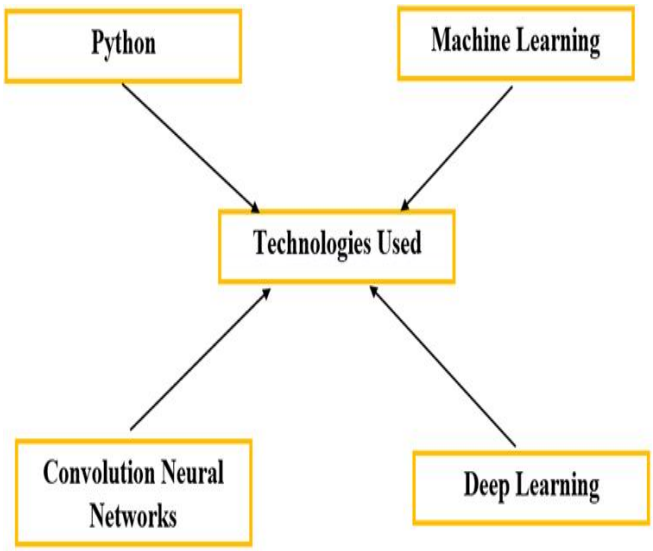

Fig 1 Technologies used

➢ *Machine Learning:*

Machine learning is used in internet search engines, email filters to pick out spam, websites to make personalized guidance, banking software to detect and find odd transactions, and lots of apps on many phones such as voice recognition. Machine learning is a branch of artificial intelligence and computer science which mainly focuses on the use of data and algorithms to copy the way that humans learn, moderately improving its accuracy. Now the technology has many potential applications, some with top stakes than others. Future developments could support the UK economy and will have a remarkable impact upon this society.

For example, machine learning can supply us with readily accessible 'personal assistants' to help control our lives, it could badly improve the transport system through the use of autonomous vehicles; and the healthcare system, by improving disease diagnoses or customizing treatment. Machine learning [Fig.2] can also be used in security applications, such as analyzing and inspecting email communications or internet usage. The involvement of these and other applications of the technology need to be examined now and action will be taken to ensure uses will be very beneficial to the society. Machine learning is distinct from, but overlaps with, some aspects of robotics.

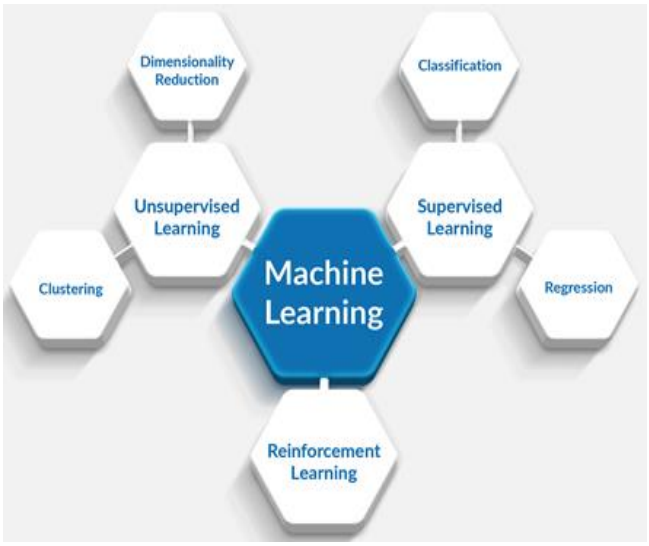

Fig 2 Machine Learning

➢ *Python:*

Python is a high-level and interpreted programming language designed by Guido van Rossum. It was written majorly to provide a language that has a very easy and simple syntax and is easy to read and understand. Due to shorter codes and easy of writing, many programmers began to progressively stick to Python for coding. It also has built-in functions and it can also operate as object- oriented, functional or procedural programming. It is also a platform independent programming language. Therefore, it is free and open source, and also has huge library support, it can be used to perform a huge variety of actions and many programmers find it very easy to learn and implement compared to many other languages. It also includes exception handling and in-built memory management techniques. Since it is dynamically typed, there are no declarations, making it dense and short. The most major part of Python is the indentation as it determines the flow of statements. Python [Fig.4] contains artificial intelligence, which makes it useful in many fields. It is also used in information security, game development and also as the base language for Raspberry Pi. Python is an amazing and best programming language. It is very simple to read but also powerful enough to do a lot of things.

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Fig 3 Python

➢ *Deep Learning:*

Deep learning is a subdivision of machine learning, which is basically a neural network with three or more layers. These neural networks attempt to imitate the behavior of the human brain and allowing it to easily learn from large amounts of data. While a neural network with a single layer can still make estimated predictions, additional hidden layers can help to enhance and refine for accuracy. Deep learning operates many artificial intelligence applications and services that improve and upgrade automation, conducting analytical and physical tasks without human interference. Deep learning technology lies beyond everyday products and services. [Fig.4]

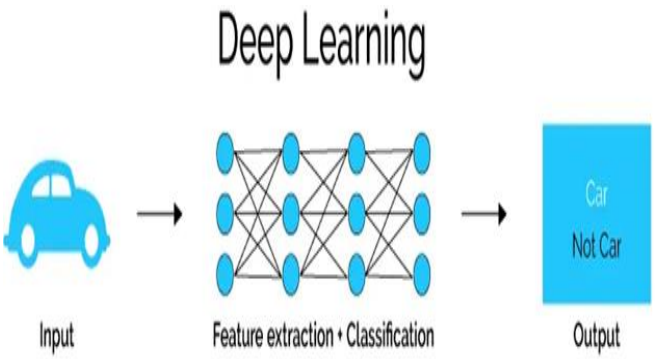

Fig 4 Deep Learning

➢ *Convolutional Neural Networks (CNNs):*

Convolutional Neural Networks (CNNs) are a type of neural network that are particularly well-suited for image and video data. They are designed to process data with a grid-like topology, such as an image, where the data in one part of the grid is connected to data in nearby parts. CNNs use a process called convolution, where a small matrix called a kernel is moved over the input data, performing a mathematical operation at each location. This process allows CNNs to learn features in the input data, such as edges, shapes, and textures, which can be used for tasks such as image classification and object detection.

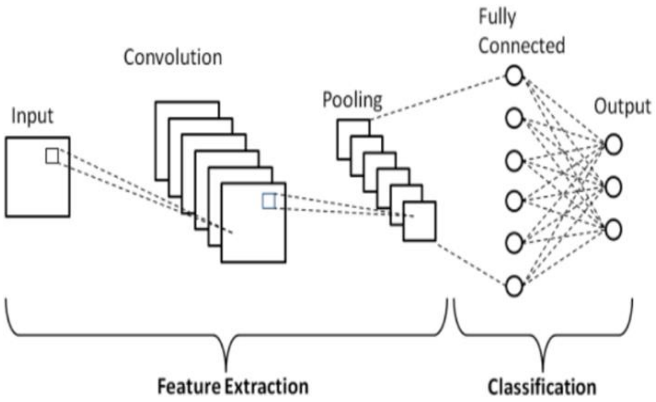

Fig 5 CNN Architecture

III. SOFTWARE REQUIREMENTS

➢ *Specification:*

SRS is a captures complete description about how the system is expected to perform. It is usually signed off at the end of requirements engineering phase. It defines how software system will interact with all internal modules, hardware, communication with each other programs and human user interactions with a wide range of real like scenarios.

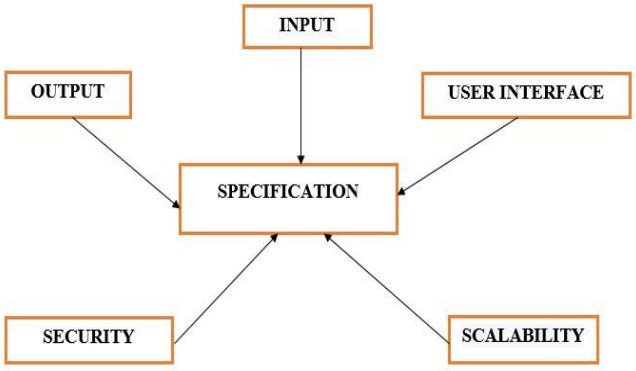

Fig 6 SRS

➢ *Input:*

The system should be able to accept a variety of input types, such as text, images, and audio, and should be able to handle multiple languages.

➢ *Output:*

The system should be able to output the predicted gender, along with a confidence level or probability.

➢ *User Interface:*

The system should have a user-friendly interface that allows users to input data and view the results**.**

➢ *Security:*

The system should be able to protect personal data and should be compliant with data privacy regulations.

➢ *Scalability:*

The system should be able to handle large amounts of data and should be able to scale to meet the needs of a growing user base.

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IV. EXISTING SYSTEM

In a gender classification system using a local binary pattern (LBP) and SVM with polynomial kernel was proposed, in which the classification rate of 94.08% on the CAS-PEAL face database was reported. A disadvantage of the method is that high classification performance can only be achieved if the block size for the LBP operator is correctly selected, which is a rather difficult task. The main disadvantages of the mentioned methods are that the feature extraction and classification modules are designed and trained separately, and they require prior application-specific knowledge in order to obtain optimal preprocessing and feature extraction designs. The primary drawbacks of the methods outlined above are that they require prior application-specific information in order to acquire the best preprocessing and feature extraction designs, and that the feature extraction and classification modules are created and trained separately.

- *Support Vector Machine (SVM):*

Support Vector Machine (SVM) is a type of supervised learning algorithm that can be used for classification and regression tasks. The main idea behind SVM is to find the best boundary (known as a hyperplane) that separates the data into different classes. The boundary is chosen in a way that maximizes the margin, which is the distance between the boundary and the closest data points from each class (known as support vectors). SVM can handle non-linearly separable data by using a technique called kernel trick, where the data is transformed into a higher-dimensional space where it becomes linearly separable. SVMs are particularly well suited for classification of complex small or medium-sized datasets. They are effective in high dimensional spaces and can handle cases where the number of dimensions is greater than the number of samples. SVM algorithm can be used to solve two-class and multi-class problems, it also can be used for outlier detection by setting a threshold on the distance from the hyperplane.

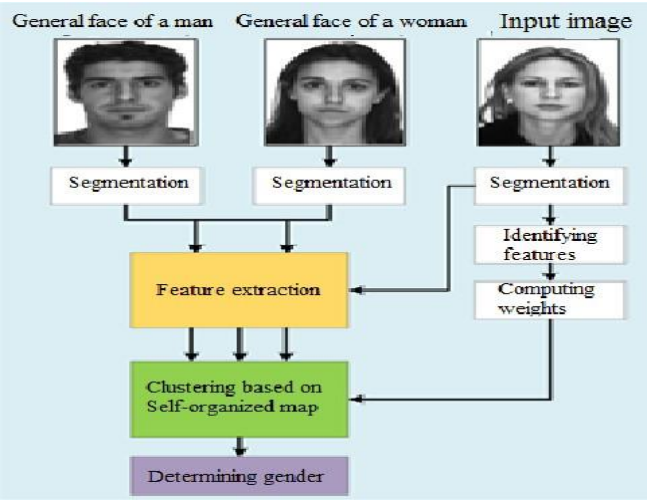

Fig 7 System Diagram

V. PROPOSED SYSTEM

In this paper, we propose a novel approach for real-time gender classification using a CNN. The main contributions of this research are as follows. First, an efficient and effective 4-layer CNN for real-time face-based gender classification is proposed. The network architecture has a reduced design complexity with a smaller number of layers, neurons, trainable parameters, and connections when compared with existing methods. In this study, we provide an unique CNN-based method for real-time gender classification. The following are the primary contributions of this study. First, a four-layer CNN with high efficiency and effectiveness is suggested for face-based gender classification in real time. When compared to current approaches, the network architecture has a lower design complexity because to its fewer layers, neurons, trainable parameters, and connections. The proposed CNN in [5] included six layers, with the output class represented by a single neuron in the last layer. On unmixed datasets using the FERET database, a classification rate of 94.7% was attained. In conclusion, the aforementioned CNN-based solutions show the possibility of getting higher performance in recognition challenges, namely gender classification.

- *Convolutional Neural Networks (CNNs):*

Convolutional Neural Networks (CNNs) are a type of deep learning algorithm that is commonly used in image and video recognition tasks. They are based on the structure of the visual cortex in the brain, which is organized in a hierarchical manner. CNNs consist of multiple layers, including convolutional layers, pooling layers, and fully connected layers. In the convolutional layer, the network learns features by convolving filters with the input image. The filters are small matrices that are used to detect specific patterns in the image, such as edges or textures. The pooling layer is used to reduce the spatial dimensions of the image, which helps to reduce the computational complexity and prevent overfitting. The fully connected layer is used to make the final prediction by combining the features learned in the previous layers. CNNs are particularly effective in tasks such as image classification, object detection, and semantic segmentation. They have achieved state-of-the-art performance in many computer vision benchmarks and have been widely adopted in a variety of applications including self-driving cars, medical image analysis, and facial recognition.

- *Advantages:*

- *High accuracy: CNNs are known for their ability to achieve high accuracy on image classification tasks, which makes them well-suited for gender classification.*
- *Robustness to variations in images: CNNs can handle variations in lighting, pose, and expression, which makes them robust to different conditions in which the images were taken.*
- *Handling real-world images: CNNs can handle images with noise, blur and occlusion, which makes them well-suited for real-world images.*

- *Handling multiple faces in an image: CNNs are able to handle multiple faces in an image, which makes them well-suited for video analysis.*
- *Transfer learning: CNNs can be fine-tuned using pre-trained models, which can save time and computational resources, also it could help to improve the performance.*
- *Applications: Gender classification using CNNs can be useful in a variety of applications such as video surveillance, social media analysis, and biometric identification.*

VI. SYSTEM ARCHITECTURE

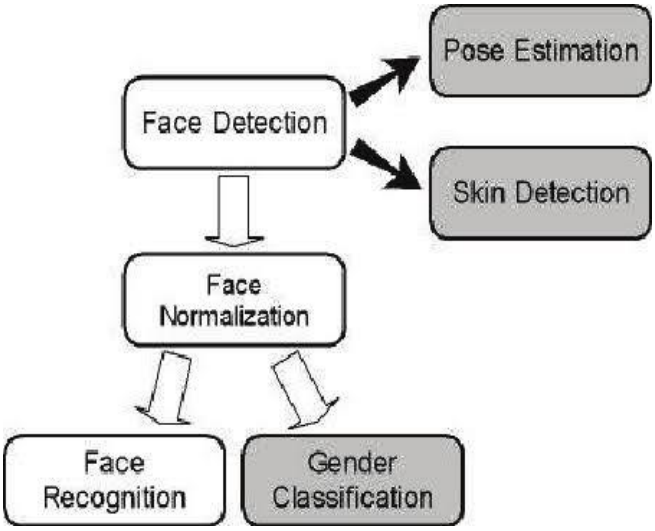

Fig 8 System Architecture

VII. FUTURE SCOPE

The future scope of gender classification using Convolutional Neural Networks (CNNs) is quite promising as it has a wide range of potential applications in various fields. Developing CNN models that can classify gender in real-time, which can be used in video surveillance and security systems. Using gender classification to personalize the interaction between humans and computers, for example, in virtual assistants or chatbots. Incorporating gender classification in robots and drones to improve human-robot interactions. Overall, the future of gender classification using CNNs is exciting, with many opportunities for research and development that can lead to new and innovative applications in a variety of fields.

VIII. CONCLUSION

Gender classification using Convolutional Neural Networks (CNNs) is a powerful and accurate method for identifying the gender of individuals in images and videos. CNNs are based on the structure of the visual cortex in the brain, which is organized in a hierarchical manner. They consist of multiple layers, including convolutional layers, pooling layers, and fully connected layers. These work together to learn features from the image and make a prediction about the gender of the individual. CNNs have several advantages for gender classification, such as high accuracy, robustness to variations in images, and scale-invariant. They are also well-suited for real-world images and can handle multiple faces in an image. Furthermore, CNNs can be fine-tuned using pre-trained models which can save time and computational resources, and improve the performance.

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BIOGRAPHIES

MR. BORUGUDDA. NAGA RAJU is currently working as an Associate Professor in the department of Information Technology from NRI INSTITUTE OF TECHNOLOGY, Pothavarappadu, Andhra Pradesh. He received M. Tech from JNTU KAKINADA and he published various national and international journals. He is a member of CSI. He is a ratified faculty from JNTU KAKINADA.

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A. Venkata Reddy is currently studying B. Tech with specification of Information Technology in NRI Institute of Technology. She done a mini project Gender Classification. He completed one NPTEL certificate.

T. Sri Manjunadha is currently studying B. Tech with specification of Information Technology in NRI Institute of Technology. She done a mini project Gender Classification. He completed one NPTEL certificate.

M. Mohan Kumar is currently studying B. Tech with specification of Information Technology in NRI Institute of Technology. She done a mini project Gender Classification. He completed one NPTEL certificate.