ABSTRACT

When a person is uniquely identified then it is because of the face which is the crucial part. With the help of a face, different people are classified and also besides these, a large number of applications can be implemented like for security purposes at banks, various organizations and also in the areas where there is a large public gathering. As the raise in usage of social media and social platforms reached up in the air, age and gender detection became prominent. The attribute information such as age and gender improves the performance of face recognition. This project proposes age and gender detection method from face images using Deep-convolutional neural network(CNN). In this study, face images of persons are trained using CNN. Training of deep models shows exceptional performance with large datasets, but they are not suitable for learning from few samples. The input faces are compared with the images in the data set and will be recognized. There are many methods which have been proposed in the literature for age estimation and gender classification. However, all of them still have a disadvantage such as partial reflection about face structure and face texture. This technique applies to both face alignment and recognition and significantly improves these two aspects. To this end, we propose a simple convolutional network architecture that can be used even when the amount of learning data is limited.

Keywords: face recognition, attribute information, Deep-Convolutional neural networks, gender-classification, age-classification.

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1. INTRODUCTION

Facial analysis has gained much recognition in the computer vision community in the recent past. Age and gender, two of the key facial attributes, play a very foundational role in social interactions, making age and gender estimation from a single face image an important task in intelligent applications, such as access control, human-computer interaction, law enforcement, etc. We formulate the age and gender classifications task as a classification problem in which the CNN model learns to predict the age and gender from a face image. We need to propose a model that uses CNN architecture to predict the age group and gender of human's faces from unfiltered real-world environments. The CNN approach addresses the age and gender labels as a set of discrete annotations and train the classifiers that predict the human's age group and gender. Then we design a quality and robust image preprocessing algorithm that prepares and preprocesses the unfiltered images for the CNN model and this greatly has a very strong impact on the performance accuracy of our age and gender classifiers. We demonstrate that pertaining on large-scale datasets allows an effective training of our age and gender CNN model which enable the classifiers to generalize on the test images and then avoid overfitting. Finally, UTKFace dataset is used to evaluate the performance of the CNN model, and despite the very challenging nature of the images in the dataset, the approach produces significant improvements in age group and gender classification accuracy. Face recognition techniques described in the last few years have shown that tremendous progress can be made by the use of deep convolutional neural networks (CNN). We demonstrate similar gains with a simple network architecture, designed by considering the rather limited availability of accurate age and gender labels in existing face data sets.

Advantages of CNN:

- Processing speed.
- Flexible and Robust
- Versatile in nature / Dynamic Behavior.

Applications of CNN:

- Decoding Facial Recognition.
- Analyzing Documents.
- Understanding Climate

ARCHITECTURES OF NEURAL NETWORKS:

Artificial Neural Networks (ANNs) make up an integral part of the Deep Learning process. They are inspired by the neurological structure of the human brain. ANNs are "complex computer code written with the number of simple, highly interconnected processing elements which is inspired by human biological brain structure for simulating human brain working & processing data (Information) models."

Feed Forward Networks: Feed-forward ANNs allow signals to travel one way only; from input to output. There is no feedback (loops) i.e. the output of any layer does not affect that same layer. Feed-forward ANNs tend to be straight forward networks that associate inputs with outputs. They are extensively used in pattern recognition. This type of organization is also referred to as bottom-up or top-down. to be straight forward networks that associate inputs with outputs. They are extensively used in pattern recognition. This type of organization is also referred to as bottom-up or top-down.

Feedback/Recurrent Networks: Feedback networks can have signals travelling in both directions by introducing loops in the network. Feedback networks are very powerful and can get extremely complicated. Feedback networks are dynamic. They change continuously until they reach an equilibrium point. They remain at the equilibrium point until the input changes and a new equilibrium needs to be found. Feedback architectures are also referred to as interactive or recurrent, although the latter term is often used to denote feedback connections in single-layer organization.

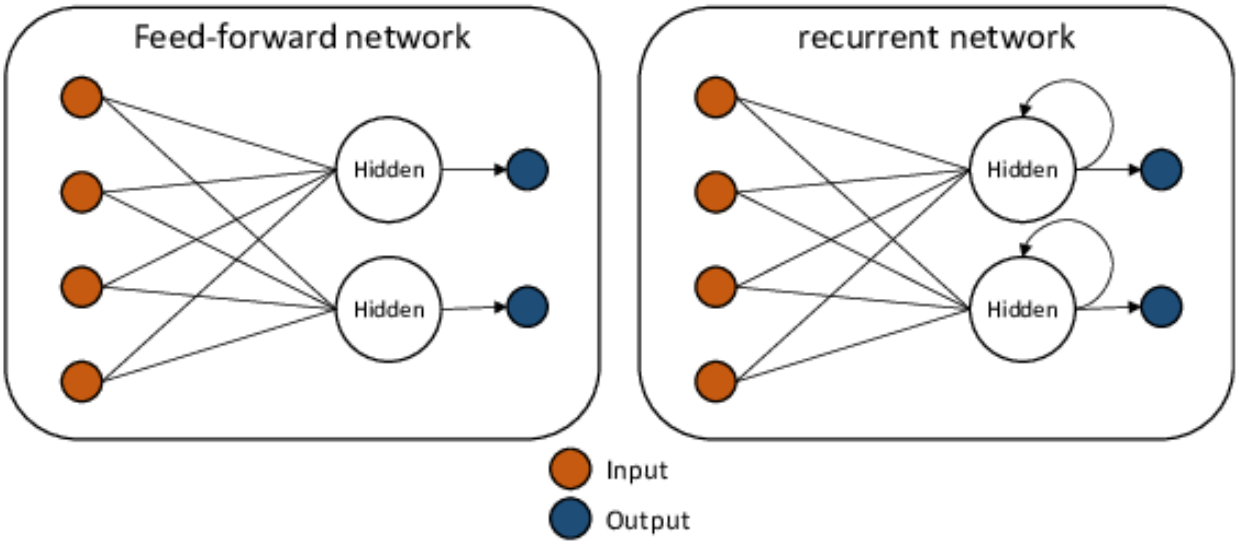

Fig 3: Types of Network Architecture

NEURAL NETWORKS VERSUS CONVENTIONAL COMPUTERS:

Neural networks take a different approach to problem solving than that of conventional computers. Conventional computers use an algorithmic approach i.e. the computer follows a set of instructions to solve a problem. Unless the specific steps that the computer needs to follow are known the computer cannot solve the problem. That restricts the problem-solving capability of conventional computers to problems that we already understand and know how to solve. Neural networks process information in an equivalent way the human brain does. The network is composed of many highly-interconnected processing elements (neurons) working in parallel to solve a specific problem. Neural networks learn by example. They cannot be programmed to perform a specific task.

On the other hand, conventional computers use a cognitive approach to problem solving; the way the problem is to solved must be known and stated in small unambiguous instructions. These instructions are then converted to a high-level language program and then into machine code that the computer can understand. These machines are totally predictable; if anything goes wrong is due to a software or hardware fault. Neural networks and conventional algorithmic computers are not in competition but complement each other. There are tasks are more suited to an algorithmic approach like arithmetic operations and tasks that are more suited to neural networks. Even more, a large number of tasks, require systems that use a combination of the two approaches in order to perform at maximum efficiency.

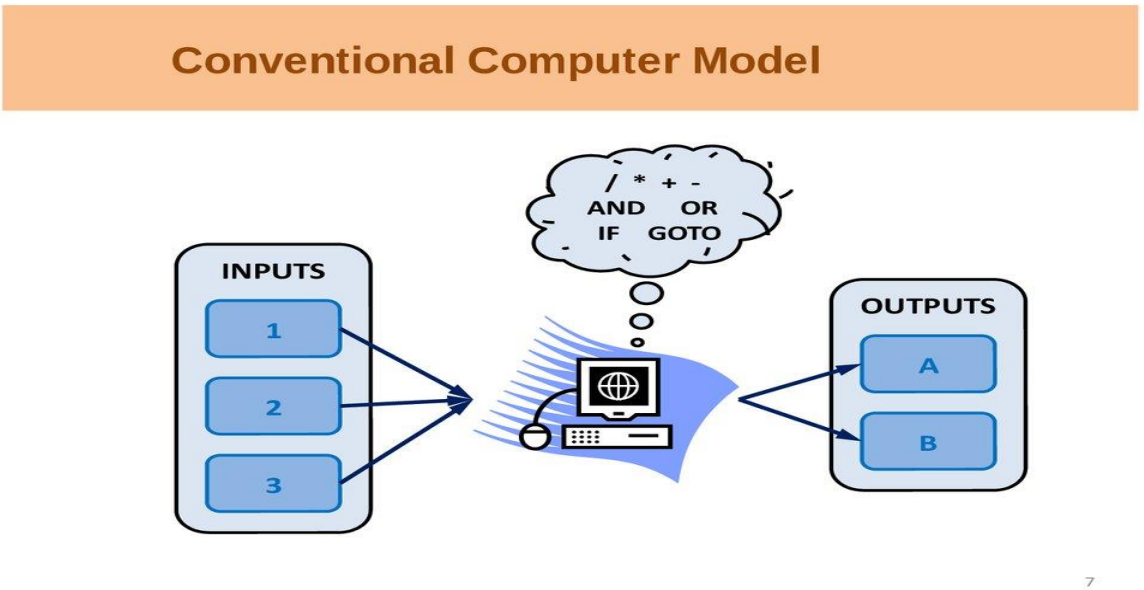

Fig 4: Conventional Computer Model

1.2 DEEP LEARNING

Deep learning is a branch of machine learning which is completely based on artificial neural networks. Deep learning is an artificial intelligence function that imitates the workings of the human brain in processing data and creating patterns for use in decision making. Deep learning is a subset of machine learning in artificial intelligence (AI) that has networks capable of learning unsupervised from data that is unstructured or unlabelled. It has a greater number of hidden layers and known as deep neural learning or deep neural network.

Deep learning has evolved hand-in-hand with the digital era, which has brought about an explosion of data in all forms and from every region of the world. This data, known simply as big data, is drawn from sources like social media, internet search engines, ecommerce platforms, and online cinemas, among others. However, the data, which normally is unstructured, is so vast that it could take decades for humans to comprehend it and extract relevant information. Companies realize the incredible potential that can result from unravelling this wealth of information and are increasingly adapting to AI systems for automated support.

Deep learning learns from vast amounts of unstructured data that would normally take humans decades to understand and process. Deep learning and utilizes a hierarchical level of artificial neural networks to carry out the process of machine learning. The artificial neural networks are built like the human brain, with neuron nodes connected like a web. While traditional programs build analysis with data in a linear way, the hierarchical function of deep learning systems enables machines to process data with a nonlinear approach. Deep Neural Network is a neural network with a certain level of complexity (having multiple hidden layers in between input and output layers). They are capable of modelling and processing non-linear relationships.

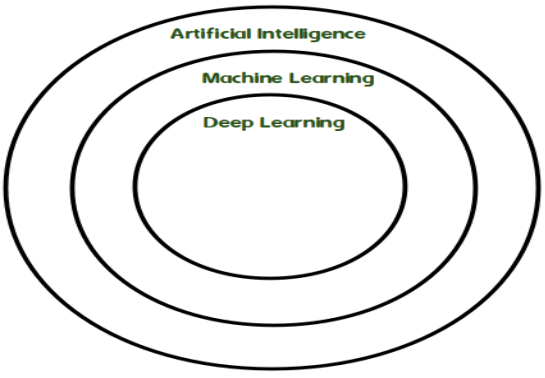

Fig 5: Architecture of Deep learning

WORKING OF DEEP LEARNING:

- First, we need to identify the actual problem in order to get the right solution and it should be understood, the feasibility of the Deep Learning should also be checked (whether it should fit Deep Learning or not).
- Second, we need to identify the relevant data which should correspond to the actual problem and should be prepared accordingly.
- Third, Choose the Deep Learning Algorithm appropriately.
- Fourth, Algorithm should be used while training the dataset. Fifth, Final testing should be done on the dataset.

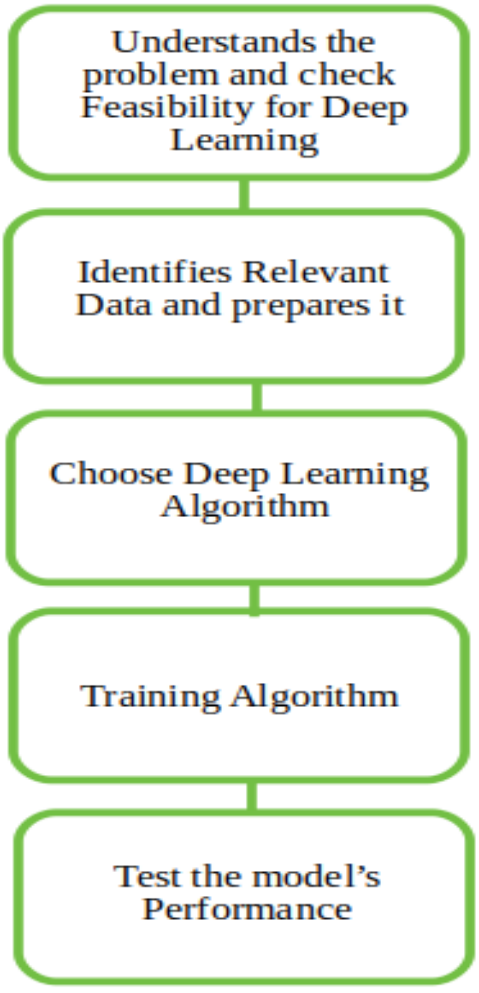

Fig 6: Flow chart of Deep Learning