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CONCEPTUAL AND COMPARATIVE ANALYSIS OF DEEP NEURAL NETWORK (DNN) MODELS AND ITS APPLICATION IN IMAGE RECOGNITION

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Abstract

In the modern business and technological environment all the industries are looking to use different technologies for automation process thereby they can enhance efficiency in operations, deliver better products and services to the customers and achieve the organisational objectives in an efficient manner. The currently nature of human lives are mainly catered in enhancing the security around homes and business, enable in safer transportation and managing road traffic, support in effective machine human interaction etc. With the current popularity of various technological devices like smart phones, tablet PC and other devices enhances the image recognition using the accumulation of data and provide better and clear pictures for the users in order to take better decisions. The implementation of deep neural networks (DNN) supports the users in identifying the images in a clearer manner, enable in segregating the objects in the images in a clearer manner so that the quality of the image can be enhanced.

In this study the researchers focus in investigating the image recognition based on the data which are collected by the users, who can be the individuals, business, governments etc. these aspects support in generating better and clear picture of the images for better analysis. The major DNN models which are focused in enhancing the image recognition and support the users in a better manner, the major models applied are recurrent neural network (RNN) and convolutional neural network (CNN) for enhancing image recognition. Moreover, the data classification may possess some noise which will impact the results adversely, hence this study tends to also understand the various noise models which were implemented by the DNN so as to mitigate the influence of noise and support in better image recognition. Hence this study is focused in applying qualitative research design, hence the researchers intend to perform the study using secondary data sources. The previous works related to the study are sourced and comparative analysis are being made so as to provide a comprehensive understanding and support I future work.

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Keywords: Deep neural network, Image recognition, convolutional neural network, recurrent neural network, medical images

Introduction

The term deep neural networks (DNN) are considered as the mathematical model which are used to impressionist of the human brain and hence focused in identifying better solutions with the available data, these data are mostly unstructured in nature. Also, the DNN models are mainly created based on the neural networks which are divided into three major layers, the first is stated as input layer, followed by hidden layer and lastly the output layer. In the current industrial revolution, companies are looking to use technologies in order to automate various activities so as to enhance efficiency, achieve productivity, lower cost and thereby enhance the bottom line (profits) of the company [1].

Due to the enhanced application in different areas of life and business-like enhancing human-machine interaction, health care services better transport and road safety, video security application etc. image recognition has now become one of the critical and most active areas in the computing industry in the current decade [2]. The overall potential of the computing in devices in recognising the images can be used in various ways like identifying the security threats, enable in quicker diagnosis of disease for patients, enable in better road safety, reduce traffic congestion and other activities. Among the various approaches, it is noted that the DNN is used to recognise the image through the available data with more accuracy. The image recognition is stated as the overall task of identifying the images and related categories through predefined classes, hence the image recognition can enable in depicting the picture and can possess the ability to distinguish from one image to another.

Image recognition is one of the areas where DNN tend to excel, these neural networks are considered as computing systems which is designed to analyse and recognise patterns, the creation of the architecture is mainly inspired based on the human brain and they tend to consist different layers for processing in an effective manner. The artificial neural networks tend to show better performance breakthrough in the image recognition and objects related classification. The main purpose of the study is to make conceptual comparative analysis of deep neural network (DNN) models and its application in image recognition [3].

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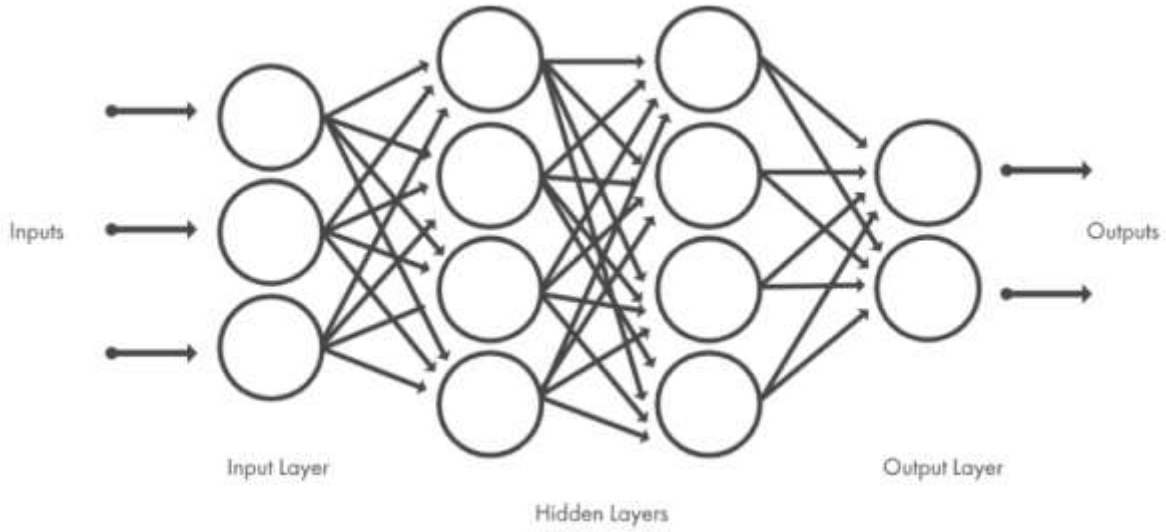

Fig 1: Deep Neural Network flow chart

(Source: Lee [4])

The enhanced implementation of the neural networks tends to come from the overall ability to learn the representation based on the training data, this enables in offering the output variable in an effective manner. Hence, the neural networks tend to apply mapping in an effective manner and achieve proven approximation algorithms.

Review of Literature

The researchers have stated that the application of convolutional neural network model is focused in enhancing the picture acknowledgement. It possesses unique features which contains input layer, enhanced concealed and yield later and max pooling later which support in recognising the objects in a clearer manner [5]. The CNN tend to contain numerous maps which are composed of two-dimensional models, each of the components possess wright network called potion and which helps in categorising the objects effectively. The CNN supports in reducing different noises which leads to degradation of the noise, blur etc. The researchers have stated that the impact of noise disrupt the images and hence implementation of better DNN model reduces the disruptions effectively.

Mingyuan [6] has measured the impact of deep neural networks in enhancing the images with more clarity and better recognition. The classification of the objects is made through better deep learning and support in achieving the necessary outputs. The researchers have also mentioned that some other works has been made in combination with different types of

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classification of different algorithms. The existing research though relatively small in analysing the noise reduction in the images using CNN, the authors has mentioned that the usage of such models tend to influence image recognition in a better manner. The presence of noise in the test data tend to negatively impact the accuracy.

It has been regarded that the implementation of Recurrent Neural Network (RNN) is also used for better output which are fed as the input to the current revolutions. The traditional neural networks tend to consider all the given inputs and outputs in an independent manner; however, it is forecasted to the next sentences. Hence, RNN were implemented so as to solve the issue with the assistance of the hidden layer, the main and critical feature of the RNN is possessing better and hidden state which support in enhancing the image recognition in a better manner.

It has been regarded hat the application of these models enables in dealing with the noises very effectively, the traditional models do not possess the necessary tools in distorting the noise, however the DNN models support in using the available neural networks with deep classification for the image restoration and recognition effectively.

Table 1: Comparative analysis of implementing Deep Neural Networks

Authors	Model	Features and Benefits
Zhang et al., [7]	Convolutional neural network	Enhances the pixel data, support in leveraging the deep hidden layer for enhancing the objects Highly effective in reducing the number of parameters Support in analysing visual imagery effectively
Mou et. al., [8]	Recurrent neural network	Image data is mainly viewed as the two-dimensional wave Support in effective machine translation Videos can also be enhanced through this model

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		There are various types which includes binary, continuous non-linear, linear etc
Kieffer et. al., [9]	Long short-term memory	LSTM uses deep learning tools for better image recognition Supports in classifying and processing using the time series data Enable in enhancing the storage optimisation effectively
Yang [10]	Traditional neural network	Uses traditional tools and does not posses any deep network for enhancing the image quality Possess lesser machine human interaction

Moreover, Said [11] has stated that the long short term memory network has also been used in order to recognise the image more elaborately. These networks are focused in classifying and processing the predictions based on the time series analysis, there is an enhanced model which enable in exploding the issues which encountered with the traditional model and enable in using the advanced tools like hidden Markov models for enhancing the image recognition. Furthermore, the comparison between the CNN and RNN has been made and each of these models tend to provide in enhancing the image recognition effectively as compared with the traditional models, however, the researcher has stated that CNN enable in addressing the restoration issues in an effective manner.

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Methodology

The study is intended to make comparative analysis of various DNN models which is influencing in enhancing the image recognitions. It has been regarded that image recognition is gaining importance in the current environment as the purposes are manyfold. The study is involved in using qualitative research design, the authors have focused in collecting the information from secondary sources like EBSCO, Google scholar and other digital libraries to collect relevant journals, thesis and research articles for presenting the study effectively [12]. It has been noted that in the recent years there has been significant attention has caught the managers in the organisation, research community and others in creating different breakthrough mainly in the field of pattern classification. The image recognition issues has been increasing as many stakeholders are looking to source various data and information in order to process the objects in the images and make quick decisions, for this purpose deep neural networks are applied [13]. The DNN possess various models which offer better discriminative aspect of the images, which was not available in the tradition model, different models were included so as to increase the overall depth of the networks in the recent years. Hence, this study intends to make a comparative analysis of various DNN models which are available in enhancing the image recognition for the benefits of the users.

Critical Discussion and Analysis

The main architecture used for image recognition and recognition work is the CNN network. Converged neural networks consist of several layers with small groups of neurons, each of which detects small parts of an image. Results from all collections on one level partially overlap to show the whole picture. The next layer then repeats this process on the new image representation, allowing the system to learn more about the composition of the image.

Brands track text posts on social media with brand references to find out how they perceive, value, how consumers interact with their brand and what they say about it and why. This is called social silence [14]. The type of social listening that focuses on listening to conversations is called visual listening. The fact that more than 80% of brand images on social media do not have the company name in the caption makes it difficult to visually hear. How to understand this case? Soon with recognition.

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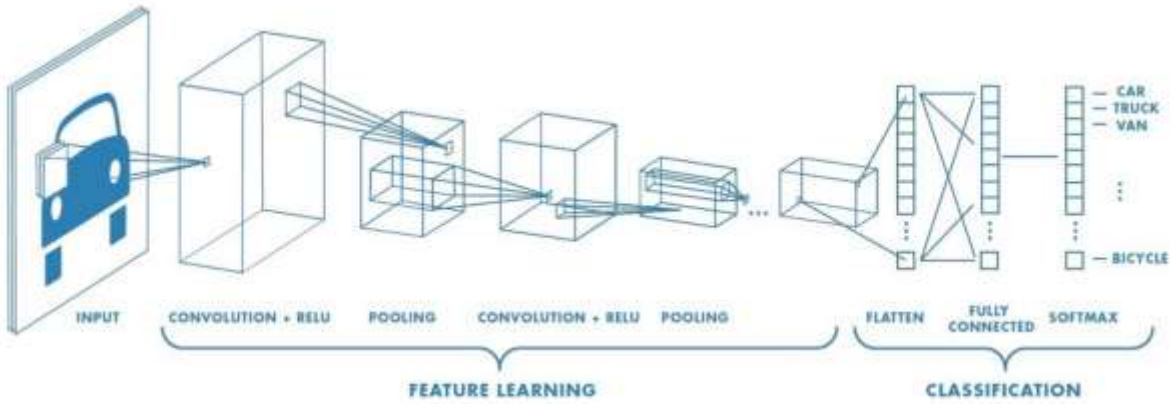

Fig 2: CNN process overview

(Source: Newman [15])

Software supported by in-depth learning models helps radiologists manage the enormous workload involved in interpreting a variety of medical images: computed tomography (CT) and ultrasound, magnetic resonance imaging (MRI) or X-ray. IBM points out that an emergency radiologist must examine up to 200 cases a day. In addition, some medical studies contain up to 3,000 images. Unsurprisingly, medical images account for almost 90% of all medical data. Artificial intelligence-based X-ray equipment does not replace doctors, but supports their decision-making [15]. Acute abnormalities are reported, high-risk patients or those in need of emergency treatment are identified and radiologists can prioritize the to-do list. IBM's research department in Haifa, Israel, is working with a cognitive radiology assistant to analyse medical images. The system analyses the medical images and then combines this information with information from the patient's medical record and presents the results that radiologists can take into account when planning treatment.

Face recognition is common with airlines using it to improve boarding and check-in. There are two main axes for this development: to keep up with self-service trends and biometric technology trends and make the airport experience safer and faster. The fewer pre-flight routines passengers and crew must follow, the better. The boarding unit scans travellers' faces and photos stored in border control databases (e.g., ID cards, visas or other documents. The boundaries between online and offline shopping have disappeared because Urban Outfitters has a Scan function + Shop, which allows consumers to physically scan can find a product found in a store or print it in a magazine, get a detailed description of it, and visual search also enhances the shopping experience online. Neural networks are computer systems designed to recognize patterns. Its architecture is inspired by human structure brain, where its name There

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are also three levels: input levels, hidden levels and output levels. The input layer receives a signal, the hidden layer processes it and the output layer make a decision or predicts input data. Each network layer consists of interconnected nodes (artificial neurons), which performs arithmetic taste.

However, it should be noted that better classification accuracy potentially results in longer training times. Applying a noise filtering strategy makes it easier to transfer weights from a previously trained model as there are more trained models available to recognize undistorted data. In addition, increased training data requires the ability to artificially distort the images or receive a large amount of noise-signalled data. This problem is less serious when a noise reduction strategy is applied, as the images used for training do not need to be labelled in this case.

In a modern business and technology environment, all industries strive to apply a variety of technologies to automation processes that improve operational efficiency, provide better products and services to customers, and effectively achieve an organization's goals. The current nature of human life is primarily to improve the safety of homes and businesses, safer transport and traffic management, support efficient machine interaction and so on. Due to the current popularity of various technological devices such as smartphones, tablets and other devices, they improve image recognition through data collection and provide better and clearer images for users to make better decisions. By implementing Deep Neural Networks (DNN), users can identify images more accurately, allowing objects to be separated into more accurate images, which improves image quality.

The term Deep Neural Networks (DNN) is seen as an impressionistic mathematical model of the human brain, so it focuses on finding better solutions with available data, and this data is mostly unstructured. In addition, DNN models are mainly based on neural networks, which are divided into three main levels, the first being referred to as the input layer, followed by the hidden layer and finally the output layer. In the current industrial revolution, companies seek to automate a variety of activities using technologies to increase efficiency, achieve productivity, reduce costs and thereby improve business results (profits).

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Table 2: Role of Deep Neural Networks in Modern environment

Authors	Area	Role and Benefits
Nan [16]	Social media analytics	Support in recognising the brand and product images efficiently. Aid visual detection and logo promotion
Feng et. al., [17]	Health care	Support in recognising and locating the tumour quickly. Enable in better treatment for the patients Application of cognitive analysis enable in gathering the historical medical records and provide better insights
	Art works	Can scan through millions of images, locate the correct art work.
Shaohui et. al. [18]	Better airport experiences	Scan the facial recognition for effective airport experiences Enhance the usage of biometric technology, support the stakeholders in better and safer travel.

Thanks to the improved application in various areas of life and interaction between man and machine, as in business, health services improve traffic and traffic safety, video safety applications and so on. industry in the current decade [19]. The global potential of computers in image recognition can be used in many ways, such as detecting security threats, diagnosing patients faster, improving traffic safety, reducing traffic congestion and much more. From the various approaches, it can be noted that DNN is used to more accurately identify the image based on available data [20]. Image recognition is the whole task of recognizing images and related categories with predefined classes. Therefore, image recognition can help you view one

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image and distinguish one image from another. Object classification is done with better in-depth learning and better support to achieve the required results [21]. The researchers also reported that other work was done in connection with different types of classification of different algorithms. Existing research, although relatively small, on the analysis of image noise reduction with CNN, the authors report that the use of such models generally has a better effect on image recognition. Noise in test data often has a negative effect on accuracy.

Conclusion

The problems with image recognition have increased as many stakeholders try to get a variety of data and information to process objects into images and make quick decisions, using deep neural networks for this purpose. DNN has different models that better distinguish the images, which was not in the traditional model, and in recent years different models have been incorporated to increase the total depth of the networks. Therefore, the purpose of this study is to perform a comparative analysis of the various available DNN models to improve the image recognition for the benefit of the users.

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