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Image to Image Search Engine

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Abstract: *In this research, we propose a concept for a search engine that enables users to input a picture from their local database and obtain data from the internet about it. With the exception of the fact that an image is submitted here as a query rather than text-based keywords, this is very similar to the conventional keyword search utilised by the majority of search engines. Because the image is the search query, finding the information corresponding to the uploaded image requires analysis and matching the image's content. This complicates the search process. This is most apt for searching information about images of dogs or any animal or thing that is identifiable.*

Keywords: Search Engine.

I. INTRODUCTION

Multimedia databases have drastically increased in size over the past ten years, particularly those kept up by the big web search engines like Google, Bing, and Ask. These search engines' hypertext search techniques are strong enough to produce results that are semantically relevant in response to text queries, but it is difficult to develop semantically meaningful search techniques for multimedia data, such as photos, video, and audio files. Because of this lack of effectiveness, the majority of current research has focused on content-based picture retrieval in particular.In a nutshell, the topic of content-based image retrieval researches ways to use meaningful content extraction and comparison algorithms for images to index, browse, and query huge image databases. The choice to update the images on the web page is made based on the degree of significance of the changes that have occurred in the images, and these content extraction methods are also employed for web refreshing approaches involving photos.

Hence, the primary topic of research in the field of content-based image retrieval is the design and development of algorithms and methodologies that can effectively retrieve image content. Because of this, many techniques for comparing photos to one another rely on the extraction of colour or texture descriptors and the organising of that data. Because it can be translated into a three-dimensional coordinate system that closely resembles human perception, colour information is more widely used.Yet, colour is frequently inappropriate because there may be grayscale images with corresponding colour counterparts. While there are techniques for describing texture and shape, they cannot be used on complex images since they contain numerous minute elements.

In this research, we present a methodology for a search engine that accepts an image as user input and retrieves web-based hypertext data using the image's content as the search criteria. In order to discover online photos that are similar to the uploaded image, we have developed a content retrieval algorithm . In order to obtain the hypertextual information for the user's inquiry, we have further utilised the textual information of the image from its website's source code.

An image-to-image search engine is a type of search engine that allows users to find visually similar images based on an example image. Instead of relying on text-based queries, users can input an image and the search engine will analyze the visual features of that image and search for other images with similar characteristics. This type of search engine is particularly useful for finding images that are difficult to describe in words or for identifying variations of a particular image. Image-to-image search engines use advanced computer vision and machine learning algorithms to compare and match images based on color, texture, shape, and other visual features. These search engines have a wide range of applications, including e-commerce, art and fashion, and visual search engines for the web.

Image-to-image search engines can also be used to build visual search engines for the web. This technology is particularly useful for search engines that specialize in finding images, such as stock photography websites or art databases. With image-to-image search, users can easily find variations of a particular image or similar images that

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match their aesthetic preferences..Overall, image-to-image search engines are a powerful tool for visual search and discovery. As computer vision and machine learning algorithms continue to improve, we can expect these search engines to become even more accurate and useful for a wide range of applications.

II. LITERATURE SURVEY

Paper [1]This research article explores how the use of deep learning in image identification might improve related fields and improve the effectiveness of various technologies. The study summarises deep learning and analyses the difficulties that this technology faces in picture classification. To address the existing issues in the current image classification process, an image classification approach based on a deep learning algorithm is proposed. This method uses multi-feature fusion to improve picture categorization by removing duplicate data and defining the image with complementary data.

Paper[2] This research paper discusses the use of artificial intelligence in licence plate recognition for traffic identification. To carry out the research, the paper examines a number of technologies, including image processing, pattern categorization, machine learning, and artificial intelligence. Obtaining vast amounts of useful data is one of the main difficulties in target recognition. The report advocates utilising the original database as the foundation for a more efficient method of manual data augmentation. The focus of research on unsupervised learning techniques, such as creating antagonistic network models, is also mentioned in the study. The research also explores how to manage the generalisation accuracy of the classifier in licence plate character recognition using evolutionary algorithms in conjunction with the best solution search tool. Following experimental validation, the genetic algorithm yields the three solutions with the best fitness, which has a somewhat positive generalisation effect.

Paper[3] This paper discusses how For search engines to perform better in web searches and information retrieval, semantic information is essential. It points out the flaw in conventional search engines, which excludes the use of images in the process of collecting semantic data. The study looks into the usage of images to enhance semantic information and enhance the performance and accuracy of web search engines. The main goal of the study is to improve the ranking of web documents by utilising semantic data from both text and images. The suggested structure is anticipated to be effective and improve the precision and functionality of web search engines. To improve query relevancy, future work will focus on extracting high-level semantic information features from photos and covering every English word to satisfy user expectations.

Paper [4] This Paper discusses the creation of a visual search engine that locates and searches for masses inside mammography images using convolutional neural networks. The engine comprises two modules: one that determines whether or not mammography images contain a mass, and the other that locates masses among images which do. The modular structure allows you freedom in customising and utilising specific parts on their own. The localization module creates a probabilistic classification map for effective dense inference using the classification module. When the decision threshold was set to 0.4, the system achieved 85% accuracy for detecting images containing masses and was able to localise 85% of the masses. At 85% sensitivity for mass detection, the system generated an average of 0.9 false positives per image.

Paper[5] The study of this paper tested a pre-trained convolutional neural network using natural images of a cat-dog dataset with around 4000 images for each category. The optimal parameter settings resulted in a classification accuracy of 88.31%, and further testing with various epochs and restricted layers showed limited potential for improvement. The study suggests that increasing training data or refining the network design and hyperparameters could improve test accuracy.

Details About The Technologies Applied:

[I] DEEP LEARNING IN IMAGE RECOGNITION:

Deep learning originates from artificial neural networks, which are network topologies with multiple hidden layers. CNN (Convolutional Neural Network Model) is frequently used to classify static images. Artificial neural network research hit a wall as technology and social science continued to grow, which led to the development of the back propagation algorithm. The ability of this technology to adapt to more complex data calculations causes the artificial neural network's learning level to gradually deepen. Convolution kernels are the type of shared weights that neurons

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inside the same feature plane can use.The convolution kernel can gain appropriate weights through learning during network training, and at the same time, sharing weights can reduce connections between networks at all levels, effectively minimising the fitting risk.Databases are crucial to the work of classifying images, particularly in the deep learning-dominated world of today. The quality of the trained model is frequently heavily influenced by the quality of the database. The images in the training set and the test set should ideally be positioned uniformly.

The most reasonable way to enhance the depth and breadth of deep convolutional neural networks—depth being the number of layers and width being the number of nodes in each layer—is to improve their performance. Deep learning emphasises the value of learning, or getting high-level features from low-level data, while also demonstrating the depth of the network and attempting to learn features at various levels. In order to build feature maps of various levels, a multi-layer network is built in such a way that the input data is successively processed by several hidden layers, i.e., the output of one hidden layer is the input for another hidden layer. This enables complex function issues to be solved with a small number of parameters. The cooperative training algorithm was initially created for multiview data, but later, when dealing with single-view data, better algorithms emerged that made use of various classification learning algorithms, various data sampling techniques, and even various parameter settings to make a noticeable difference.

[II]APPLICATION OF KERAS AND FLASK

Keras is an open-source neural network library written in Python. It is designed to provide a user-friendly interface for building deep learning models with support for convolutional neural networks, recurrent neural networks, and other common architectures. Keras is built on top of TensorFlow, allowing it to leverage the underlying computational graph capabilities of TensorFlow. It has become a popular choice for both beginners and experienced deep learning practitioners due to its simplicity, flexibility, and ease of use. Keras also provides pre-trained models for a wide range of tasks, making it easy to start building high-performing models without requiring extensive domain expertise.Keras is a Python-based high-level neural network API that can run on top of popular deep learning frameworks such as TensorFlow, Microsoft Cognitive Toolkit, and Theano. It was created with the goal of allowing for rapid experimentation and prototyping of deep learning models.

Keras provides a simple and intuitive interface for building neural networks, including support for convolutional neural networks (CNN), recurrent neural networks (RNN), and combinations of the two. It also includes a wide range of pre-trained models, which can be used for a variety of tasks such as image classification, object detection, and natural language processing.One of the key features of Keras is its ability to run seamlessly on both CPU and GPU, allowing for fast training and inference of deep learning models. It also includes a range of tools for data preparation and preprocessing, such as data normalization, data augmentation, and feature scaling.Keras has gained widespread popularity in the deep learning community due to its ease of use, flexibility, and scalability. It has become one of the most widely used deep learning frameworks in both academia and industry.

A tiny web framework based on Python is called Flask. Its lack of a database abstraction layer, form validation, and other components where pre-existing third-party libraries offer common functionality distinguishes it as a micro framework because they are not required for use. On the other hand, Flask allows for extensions that can increase application functionality as if they were already part of Flask. Flask is a popular choice for developing small to medium-sized web apps and APIs since it is simple to set up and use. It is well-known for its ease of use, flexibility, and compatibility with other Python libraries. Flask is a Python-based lightweight and flexible web framework that makes it easy to create web applications.It is simple to use and takes a minimalist approach to web development, making it suited for small to medium-sized applications. Flask supports URL routing, templating, session management, and file uploads, and it is compatible with the majority of common web servers, including Apache and Nginx. It is frequently used in the development of RESTful APIs, online applications, and microservices. Flask also has a huge and active development community, with many plugins and extensions available for use.

[IV] VGG 16 MODEL

The Visual Geometry Group (VGG) at the University of Oxford created the convolutional neural network (CNN) architecture known as VGG16. In the realm of computer vision, it is a widely used model, especially for picture classification applications.VGG16's architecture consists of 16 layers, including 3 fully connected levels and 13

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convolutional layers. The 3x3 convolutional layers' filters have a stride 1 and padding 1 value. The pool size for the max pooling layers is 2x2 with stride 2. The final output layer has 1000 neurons, which corresponds to the 1000 classes in the ImageNet dataset, while the fully linked layers have 4096 neurons each.

VGG16 is remarkable for using a modest (3x3) filter size throughout the network, allowing for deeper topologies without substantially increasing the number of parameters. Its homogeneous architecture, which makes it simple to comprehend and use, is another advantage.In a number of image classification benchmarks, notably the ImageNet Large Scale Visual Recognition Competition (ILSVRC) in 2014, VGG16 has produced state-of-the-art results. Unfortunately, due to the 138 million parameters, it is computationally expensive and unusable for some applications.VGG19, a modification of the VGG architecture with 19 layers, as well as lesser iterations like VGG11 and VGG8, have been suggested as solutions to this problem. In addition, rather than starting from scratch, pre-trained VGG models can be improved using transfer learning techniques on smaller datasets.

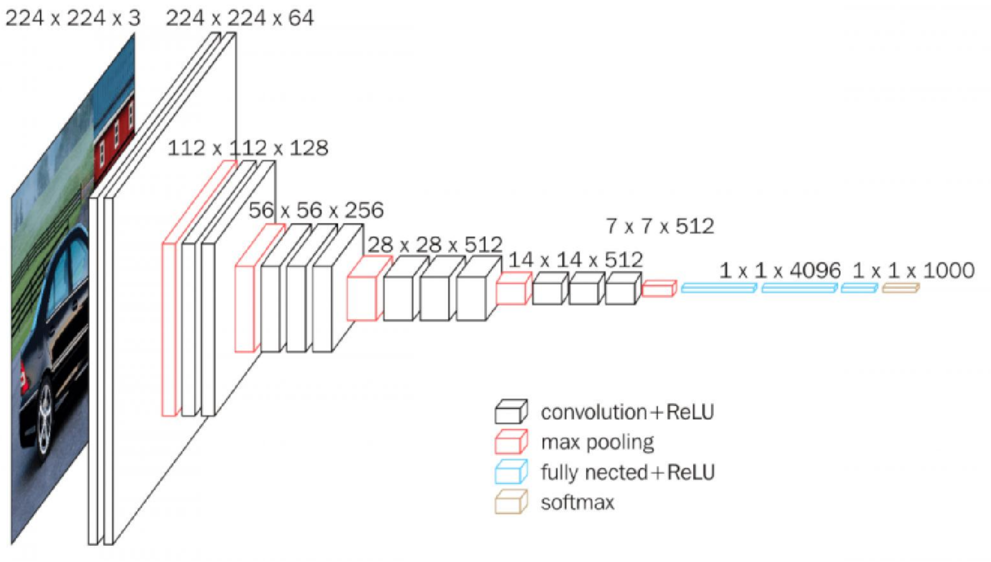

Fig 1.1 Working Of VGG 16 Model

III. RESULTS

We started off by building a little CNN from nothing. The architecture of CNN is simple, consisting of seven convolutional layers followed by one highly linked layer. We calculated our accuracy score using the old CNN and found that it was 58%. The CNN that was created from scratch does just ok with this accuracy score. If we had a large enough training dataset, which we don't, we could increase the accuracy. After utilizing VGG 16 model and fine-tuning it we got an accuracy of 90.31%. We needed to Fine-tune the VGG 16 because it is trained of millions of images of datasets which we don't have. We have done Fine tuning on the fruits dataset.

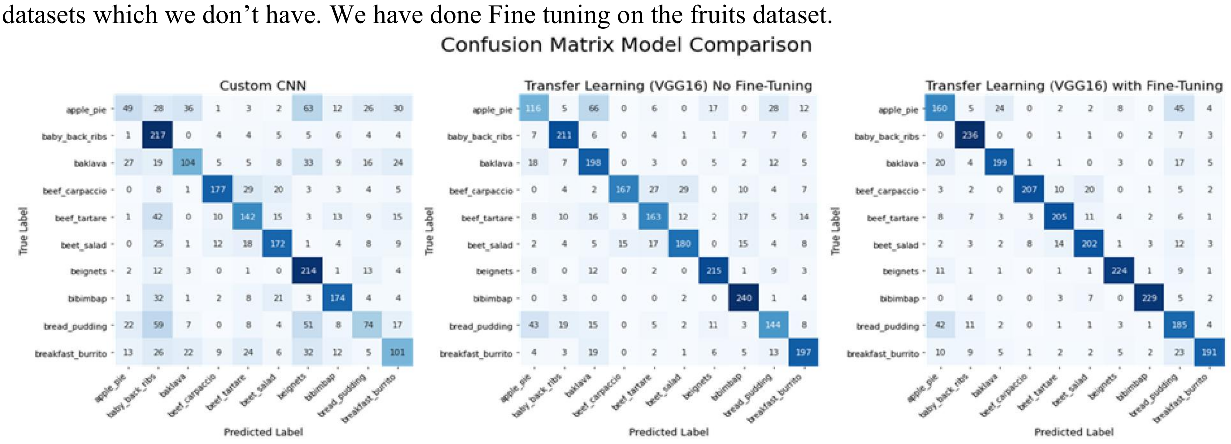

Fig. 2.2 Results of Transfer Learning With & Without Fine Tuning

IV. CONCLUSION

This paper describes the successful implementation and testing of a method for extracting image content, and the results were deemed satisfactory. This method can be used in a search engine, where a user can input an image for which they have no information, and the search engine will provide relevant information related to the image. This type of search engine has the potential to advance computing to the next level.The successful implementation and testing of this method indicates that it is effective in accurately identifying and extracting relevant information from images. This can be especially useful in situations where users have access to an image but do not have any information about it. By inputting the image into the search engine, they can retrieve information about it quickly and easily.

The potential for this type of search engine to advance computing to the next level lies in its ability to provide users with relevant and accurate information quickly and efficiently. With the increasing use of images in various industries, including healthcare, education, and entertainment, the ability to extract and analyze image content will be critical for making informed decisions and advancements in these fields.In conclusion, the successful implementation and testing of this method for image content extraction has the potential to revolutionize the way we use images in computing. The ability to extract relevant information from images quickly and accurately will be invaluable in many industries, and will undoubtedly lead to further advancements in the field of computing.

V. ACKNOWLEDGMENT

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