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What is Image Recognition?

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***Abstract* -In recent years, Image recognition has become a buzzword in the tech world. Deep learning has changed the entire world over the past few years image recognition is one of the striking features of deep learning. Every day, more applications depend on neural networks which are the core component of deep learning in fields of object detection, identification, and classification. In the paper, we have discussed about what is image recognition, some real world examples, image recognition tools, opportunities, uses and problems in image processing.**

***Keywords* -Image Recognition, Neural Networks, Deep Learning, Facial Recognition.**

I. INTRODUCTION

Image recognition is a phrase for computer sciences that can identify places, person, text and behavior in images and combination with a camera and artificial intelligence software through the use of algorithms and machine learning concepts that identifies similar patterns and classifies them in a group. Example: Google image search, Google API Cloud Vision, Amazon Recognition, Google Lens (Mobile Application) or Bixby Vision (Mobile Application). Some Real-World Example of Image Recognition.

1. Self-Driving Vehicles

Self-driving vehicles or Driverless vehicle which is able enough to sense its surroundings and moving safely with no human input. Several training models are prepared for different functionality While some models pin-point pedestrians, others are proficient at identifying street signs and some good at mapping roads. A vehicle can be trained by millions of AI models while driving down the road without human intervention. Example: Tesla.

2. Language Identification

Image recognition is at a preliminary stage where smartphones can differentiate between different dialects. Now we can simply scan any text written in any language and know its meaning in any language we want. For example, a machine will compute and decide that an individual is speaking in English. It will then judge based on the dialect.

3. Facial Recognition

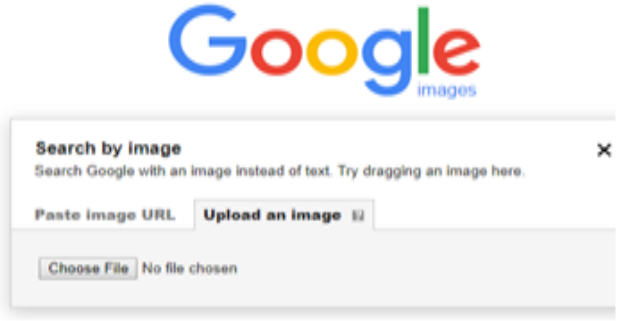
Facial recognition is one of the most common appearances of image recognition we use in our day to day life now we can even unlock smartphones with our face and also Every time when we upload a photo to Facebook, the platform uses facial recognition algorithms to identify the people in that image and then help to tag the person using facial features. Certain government bodies around the globe use facial recognition sciences to identify and catch fugitives.

II. WHY IMAGE RECOGNITION?

Image recognition is a great work for developing and testing machine learning approaches for a better tomorrow. How does the brain translate the physical object in front of our eyes into a mental model of our surroundings We don't think anyone knows exactly how our mind does it. The point is, it's seemingly easy for us to do so easy that we don't even need to put any conscious effort into it but difficult for computers to do so.

1. Google Image Search

Google Images is a product by Google. It allows users to search image content on the world wide web and matching image is displayed. Google Images is a free online tool that can be used by anyone irrespective of a device. Presented image is analyzed to find pointers such as colours, points, shapes, and textures. Noticeable features of the image are used to produce a search query. The query is searchedwith the images in Google's database. Google's search and match algorithms return matching and same images as results to the person searching.



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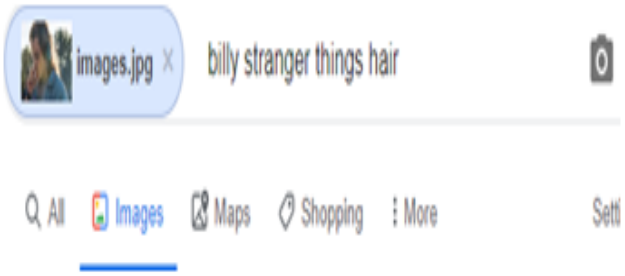

Fig.1. Google Image Search.

2. Google API Cloud Vision

Google API Cloud Vision is a web based service. Beyond that, there is a tiered pricing model based on the number of units that you use in a month. Google API Cloud Vision classifies an image in different columns that Comprises of Objects(Person, Outerwear, Hat), Label(Human, Tree, Photography), Web Entities(Similar web results), Properties(Dominant colours, Crop Hints) and Safe Search(Adult, Spoof, Medical, Violence, Racy), which allows you to analyze images in many useful ways from recognizing explicit content to detecting emotional cues in faces and background scenery. It's one of the most powerful tools you'll find.

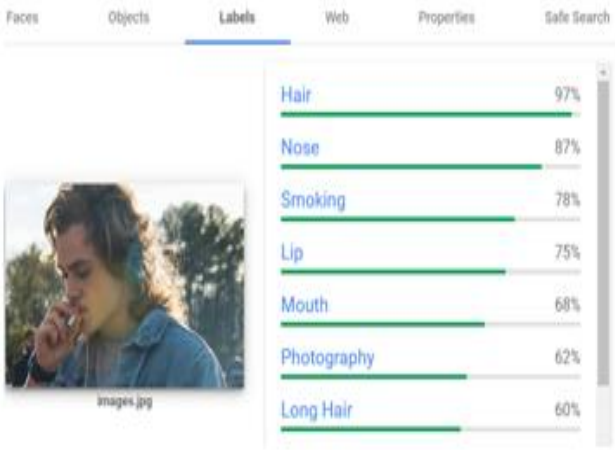

Fig.2. Google API Cloud Vision.

3. Amazon Recognition

Amazon Recognition comprises both video and image analyzing. It is a paid web application although there is a free tier in which customers can analyze 5,000 images per month and store up to 1,000 face metadata each month, for the first 12 months. Beyond that, there is a tiered pricing model based on the number of units that you use in a month. Amazon Recognition not only analyses still images, it can also provide insight into videos. It's a highly-technical program capable of classifying key features in Object, scene, and activity detection, Facial recognition, Facial analysis, Pathing, Unsafe content detection, Recognize celebrities, Text in images, etc.

Fig.3. Amazon Rekognition.

4. Google Lens

Google Lens is a free image recognition application developed by Google. Google Lens uses TensorFlow architecture for its working. It was first provided as a standalone app, later being integrated into Android's standard camera application (Google camera). We can simply scan any object which extracts the feature of that object and display back the result to the user.

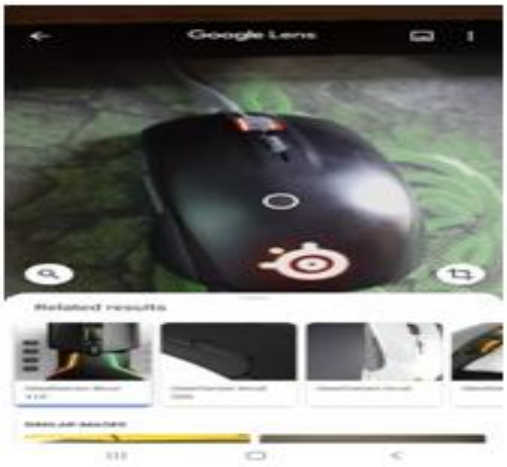

Fig.4. Google Lens.

5. Bixby Vision

Bixby is Samsung's intelligent agent (IA) which is only presented in Samsung devices. As Bixby is an intelligent agent it is not limited to scan images etc. But it also adapts to your needs by learning your routine, the apps you like to use, it comprises all features which can be seen in Google's assistant. Bixby Vision can also be used for scan images, food, text, and QR codes to get the information you need to know about the object you scanned.

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Fig.5. Bixby Vision.

III. CHALLENGING PROBLEMS IN IMAGE RECOGNITION

Major Issues in Image Processing are Image Filtering, Image Restoration, Image Registration, Image Fusion, Image Segmentation and Image Classification.

1. Recognition

A model is trained and access the dataset that is randomly split into test sets and training. The test set thus has the same data circulation as the training set, as they both are taken from the same range of image content and imaging conditions that exist in the dataset. In real-world testing, the test images may come from different sources from those which were used in training. Such a difference in data distribution can lead to big drops in correctness over a wide range of deep network architectures.

2. Comprehensive Scene Understanding

In addition to theissues related to training data and generalization, an important point which is comprehensive scene understanding i.e. recognizing and locating objects in real-time to objects in visuals and acquiring brief apprehension of scenes which requires data beyond objects visual aspects.

3. Image Quality

Imagequality plays a huge role when image analyzing is kept in mind while training model as input images are ofhigh quality. Low-resolution, other image quality distortions have a huge effect on the performance since images are of poor quality. Low-resolution images consist of very limited information which cannot be used to identify or detect image as most of the important details are lost. This increases the chances of drop down of accuracy in recognizing image drastically.

IV. OPPORTUNITIES

Image recognition is a promising region in discovering future technologies. Image Recognition has a huge significance in applications in the area of image analysis, machine learning, computer vision, pattern recognition.

Opportunities in Image Recognition Advances in image processing, analysis andAI willlead to huge advancements in diagnosing medical conditions, performing surgery, and automatic driving all forms of transport. With increasing pace and improvement in modern computing, the idea of computation can grow much bigger than the current limits, as in future image processing technology can advance several folds.

Using wide ranging homogeneous cellular arrays of simple circuits to perform image processing and analysis work and to show pattern-forming marvel will be a popular topic. The cellular neural network is an executable substitutetofully connect neural networks and is growing into an example for future imaging processing techniques. The practicality of this method has applications in the areas of silicon retina, pattern formation, prosthetics, etc.

Uses of Image Recognition

- **Disability** – Robotics navigation systems for the visually impaired will create real-time 3D maps. Vibrating sensors would convey instructions to the aiding navigation, creating a huge advancement in helping the handicapped.
- **Defence -** Military robots with a great vision sense can carry out dangerous unmanned missions, with help of real-time footage, remote rescue operations, attack operations etc.
- **Traffic-**Drones will shoot and process real-time images of traffics and send them back to your mobile consequently. You can drive safely and bypass congestions. This will give the users a real time heads up for any form of contingency, this help emergency vehicles like ambulance and fire trucks.
- **Crime -** Artificial intelligence software can search through millions of photographs and videos in a few minutes to nab a fugitive on the run.
- **Healthcare-** 3D images can help doctors to perform risky surgeries of delicate areas like inside veins which they otherwise could not have this will lead to much higher mortality rate and we can calculate risk factor in surgery.

V. CONCLUSION

Image recognition is used in multiple type of real-time applications like improving medical diagnostic imaging. This can help to perform critical surgeries, its biggest application is the identification of fugitives and criminals using facial recognition on footages or real-time CCTV images. Facial recognition can create privacy issues of personal as individual's face in the street can be identified using a face recognizer and identified images from social network sites like Facebook or LinkedIn, then it becomes possible not just

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to identify that individual, however conjointly to infer further, and additional sensitive, data even your smart phones which carry a lot of information about you can be unlocked using facial recognition.

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