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Application of Google Lens to Promote Information Services beyond the Traditional Techniques

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Abstract: The paper discusses the various facets of Google Lens to understand how Google Lens can replace traditional techniques of library services and to use Google Lens in the libraries and information centers for providing information to the users and even enhanced and enriched outreach services. The study has employed qualitative analysis of the literature and observation that seeks to understand the application of Google Lens for ensuring the better services to patrons and to put forward the authors perceptions based on observation and experience. The findings showed the power of Google Lens, the benefits of Google Lens over traditional procedures, the benefits of Google Lens in enhancing information services, and created awareness among information professionals and users regarding the use of Google Lens as a single search platform for the required resources. This study lays focus on certain areas where Google Lens can be used. While the scope of paper is restricted to explaining how Google Lens can promote the level of customer-oriented services for user communities, but the very advantage of this study is to express the usefulness of Google Lens for quick and accessible spread of information.

Keywords: Google Lens; Housekeeping Operations; Information Services; QR Code; RFID Technology; and Digital Libraries

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1. Introduction

Google Company developed the Google Lens as an innovative technology capable of recognizing images to fetch relevant information regarding every object using the artificial neural networks (Adeleke and Olorunsola, 2010). Google had officially announced the launch of this technology on the 4th day of October, 2017 (Angevaare, 2010) as a standalone application which was later combined with the camera application of any android smartphone (Bhoi, 2017). The technology allows the cameras of any android-based mobile device to read the barcodes, labels, QR codes and texts attached to any object and provide more informative data about the object (Buarki, Hepworth and Murray, 2011). The scope of this technology can be understood from the fact that pointing the mobile camera to any Wi-Fi label having the name and password of the network, allows for automatic connection to the network after the usual process of scanning. Both Google Photos and Google Assistant use the same technology (Castelltort and Martin, 2018).

Google Lens succeeded the former technologies which were previously launched by Google but had lower capabilities (Chandrakar and Arora, 2010; Cholin, 2005). The capabilities of Google Lens in detecting objects using Artificial Intelligence (AI) is similar to Bixby Vision and Image Analysis Toolset. To further develop the capabilities of Google Lens, Google added four new features in 2019. These include capability of recognizing and recommending items from a menu, calculation of tips and splitting of bills, preparing dishes from any recipe, and using text-to-speech (Conditt, 2017).

Google Lens finds application in several fields, principal among which have been mentioned below. Google Lens allows for copying text from any physical source like books, white boards, and banners into the phone's clipboard and also to the desktop or laptop system. It can also convert selected texts into sounds and extract texts embedded within photographs. The technology also allows for translation of a foreign language into a known language mainly by using Cross-Language Information Retrieval (CLIR) techniques. Scanning of barcodes and QR codes is another feature of the Google Lens (Dobie, 2017). This paper looks in the first step at the literature to discover a thorough understanding other researchers have already acquired of the impact of cutting-edge technologies on the essence, level and outcome of processes and services of information agencies and makes an attempt to understand how Google Lens can replace the traditional methods, techniques and mechanisms of library services.

2. Looking into the Past Literature

The advances made during the past decades in the fields of information technology, especially in Artificial Intelligence and Machine Learning have not only increased the possibility of accessing, storing and processing information within the libraries and information centres but also have brought about tremendous changes in the notion, organisation, working and management of all information systems (Grigonis, 2017). While the technological revolution has improved the procedures of conducting search for and retrieval of information, use of computers and associated technologies have increased the efficacy of management processes and have provided new vistas at enhancing the capacity of response to the users. New solutions and trends of information technology applications can help create, store, transfer, and use both implicit and explicit knowledge in and among corporations as well as fostering (Guo, *et al.*, 2017) customers to be more engaged in the new products and services of every successful information agency (Hall, 2022). The uncountable studies that have been conducted on enhancing library services have advocated use of computer technology in libraries. The use of state-of-the-art technology and proper infrastructure would certainly help in providing better and efficient services to the users.

Google Lens is an artificial intelligence driven technology that uses the camera in the smartphone and deep machine learning techniques to perceive the object that is kept in front of the camera lens, besides understanding it and offering actions like translation, scanning, shopping, and more. Announced by Google in 2017, Google Lens has come a long way and is an inseparable part of all android devices.

Google Lens allows the users to point the phone at some object like a specific book, and then ask the Google Assistant the nature of the object the user is pointing at. The user will not only get the answer but also suggestions that are based on the object, like publisher of the book, nearby book stalls who sell this book and other related information.

Among the other functions of Google Lens include taking a picture of the SSID sticker on the back of a Wi-Fi router using Google Lens, and the phone will automatically join to the Wi-Fi network without the user having to do anything else. That's right, no more crawling under the cupboard to read the password while typing it into the phone. The user can now literally point and shoot with Google Lens.

Restaurants, clubs, cafes, and bars will also be recognized by Google Lens, with a pop-up window displaying reviews, address information, and

opening hours. The capacity to recognize commonplace objects is particularly astounding. If the user points it at a hand, it will offer the thumbs up emoji, which is amusing, but if you point it at a drink, it will try to figure out what it is.

The functionality of Google Lens has been tested with a glass of white wine (Figure 1). Though Google Lens was not able to suggest white wine, it suggested a wide variety of other alcoholic beverages, letting the user tap through to see their composition, how to make them, and other related information. The result of this test points to the fact that while Google Lens is both clever and fast, it is not always precise. Google Lens has also been tested with many garden plants and it was found to be quite useful in finding the plant that was being grown.

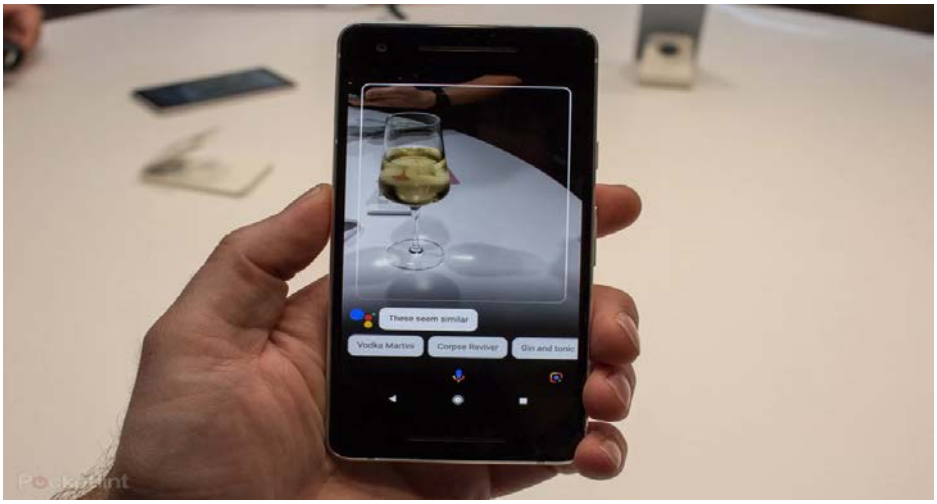

Figure 1: Using the Google Lens (Han, *et al.*, 2017)

Google Lens can do much more than what has been described in the preceding sections. A few of the features of Google Lens have been described in the following sections.

Figure 2: Functions of the Google Lens (Han, *et al.*, 2017)

(i) Translate: With Google Translate installed, the user can point the phone at text and have it lived translated text right in front of the eyes. This can also be done without an internet connection (Figure 2).

(ii) Smart Text Selection: The user may use Google Lens to highlight text and copy it to use on his/her phone after pointing the phone's camera at it. As an example, consider being able to point the phone at a Wi-Fi password and copy/paste it into a Wi-Fi login screen.

(iii) Smart Text search: When the user highlights text in Google Lens, s/he may use Google to search for that text. This is useful if the user needs to search up, for example, the definition of any word.

(iv) Shopping: If any user finds a dress, s/he likes while shopping, Google Lens can recognise it as well as related items. This works for almost every item one can think of, as well as for shopping and reading reviews.

(v) Google assignment problems: The user can simply scan the question to see what Google returns.

(vi) Look around you: Google Lens will recognise and identify the surroundings if the user points his/her camera around him/her. This could include information about a landmark or information about different types of food, including recipes.

Google Lens makes use of computer vision, Machine Learning methods and Knowledge Graph developed by Google to convert the observed objects into a pictorial search box capable of identifying objects or copying and pasting texts from literature into their phone:

(i) Region Proposal Network

After Google Go's Lens captures a picture, it must decipher the shapes and text. This is critical for jobs involving text recognition. In order to discover character level bounding boxes that can be merged into lines for text recognition, optical character recognition (OCR) uses a region proposal network (RPN). Region Proposal Network is a fully convolutional network that predicts object limits and objectness scores at each point simultaneously. RPN has been taught to create high-quality region proposals, which Fast R-CNN uses for detection. In a nutshell, it instructs the unified network where to look. This YouTube video, for example, shows how one can take advantage of Google Lens to convert notes to the text (https://www.youtube.com/watch?v=KPCCK9Zz3H0&ab_channel=Aitrepreneur).

(ii) Knowledge Graphs

An image with a bounding box around detected text may be found on the left. "Cise is beauti640," says the raw optical character recognition (OCR) output from this image. Google Lens detects the words "life is lovely" by using Knowledge Graph and context from neighbouring words, as shown on the right (Figure 3).

Figure 3: Knowledge Graphs (López, Peón and Ordás, 1970)

Because the photos captured by Google Lens may contain sources like signage, handwriting, or documents, a plethora of new challenges may arise. It's possible that the text is obfuscated, stylized, or indistinct, causing the model to misread terms. Google Lens uses the Knowledge Graph to provide contextual

clues, such as whether a word is likely a proper noun and should not be spell-corrected, and other such details, to improve word accuracy.

(iii) Convolutional Neural Networks (CNNs)

Convolution neural networks have been the backbone of many computer vision applications as enormous datasets and compute resources have become available. The discipline of deep learning has mostly shifted toward the building of CNN architectures for enhancing image recognition performance.

CNNs are used by Google Lens to detect cohesive text blocks, such as columns, or text that has a consistent style or colour. Then, within each block, it determines the final reading order using signals such as text alignment, language, and the geometric relationship between the paragraphs.

Separable convolutional neural networks with an extra quantized long short-term memory network handle all of these processes, from script detection and direction identification through text recognition. The models are trained using data from a range of sources, including ReCaptcha and Google Books scanned photos.

Image capture on low-cost devices, such as those running Android Go, is difficult since it must function on a wide range of devices, many of which have fewer resources than flagship phones.

They released CameraX, a new Android support library, to create a universal tool that can reliably shoot high-quality photographs with low lag. CameraX is an abstraction layer over the Android Camera2 API that tackles device compatibility difficulties, and it's available in Jetpack—a collection of libraries, tools, and guidance for Android developers.

To balance capture latency versus performance impact, CameraX is utilised to develop two capture methodologies.

(iv) Neural Machine Translation Algorithms

Translations must be both accurate and relevant in order to deliver the most useful information to consumers. Google Lens use Google Translate's neural machine translation (NMT) algorithms to translate complete phrases at a time rather than word-by-word, preserving proper grammar and diction.

To be most useful, the translation must be given in the context of the original text. German sentences, for example, are typically longer than English sentences. Google Lens redistributes the translation into lines of comparable length and selects an appropriate font size to match to provide this smooth

overlay. It also uses a heuristic that assumes the backdrop and the texts have different luminosities and that the background takes up the bulk of the space to match the colour of the translation and its background to the original text.

(v) DeepMind's WaveNet

WaveNet directly models the audio signal's raw waveform, one sample at a time (Figure 4). It's a fully convolutional neural network with multiple dilation factors in the convolutional layers, allowing the receptive field to grow exponentially with depth and cover thousands of time steps.

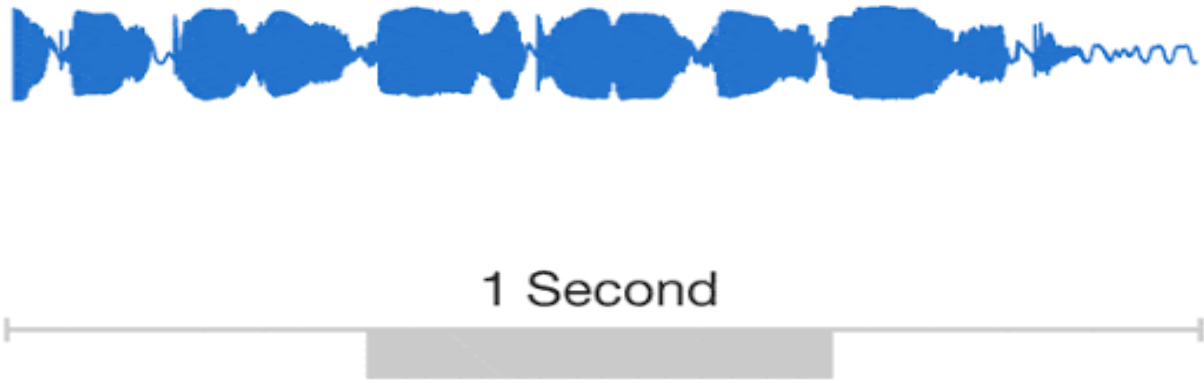

Figure 4: DeepMind's WaveNet (López, Peón and Ordás, 1970)

Reading the text aloud is the most effective approach to use Lens on Google Go. For high-fidelity audio, Google employs machine learning to disambiguate and detect elements like dates, phone numbers, and addresses, and then utilises DeepMind's WaveNet to synthesise lifelike speech.

Google Lens, as a smartphone camera-based application, offers a lot of promise for people who struggle with reading and other language-related issues. Google Lens can be quite useful in remote places in countries like India. For someone with little formal education, an ATM interface, for example, can be intimidating. Because Google's service is designed for low-cost smartphones, all a user has to do is position the phone in front of the ATM screen, and the phone will read the text on the screen aloud. This service can be expanded to include reading textbooks or interpreting contract terms and conditions. This video on the YouTube is an example of using smart phone technology to get cash money

of an ATM (https://www.youtube.com/watch?v=5pkm_SYkcbI&ab_channel=CNET).

The text-to-speech capability in Google Lens can be a lifesaver for the almost 800 million people worldwide who struggle to read. Anyone may now aim their phone at a text and hear it read aloud. This new function, which is also available through Google Go, is another approach to assist more individuals comprehends the world around them.

3. Architecture and Algorithms in Deep Learning

As has been mentioned in the previous section, Google Lens makes use of deep learning methods to accomplish the different tasks. This section illustrates the architecture and the algorithms that are used in deep learning. Deep learning has become a buzzword in the computer sector in recent years. Over the last five years, deep learning has transformed the entire globe. Every day, more applications in industries such as healthcare, object detection, finance, human resources, retail, earthquake detection, and self-driving cars rely on neural networks. The results of previous apps have been continually improving. Deep learning, also known as deep neural learning or deep neural network is a type of machine learning.

Understanding Deep Learning

Deep learning is a type of machine learning that takes an input A and predicts an output B. Deep learning analyses data and discovers patterns that may be used to make decisions. Let's imagine the inputs are dog and cat images, and the outputs are labels for those images (i.e., is the input picture a dog or a cat). If a dog is labelled in an input, but the deep learning algorithm predicts a cat, the deep learning system will learn that the physiognomy of the provided image (e.g., sharp teeth, facial characteristics) is connected with a dog. Deep learning finds utility in:

(i) Autonomous Vehicles: Some versions can pinpoint pedestrians, while others can recognize street signs and some can map roadways. While driving down the road on its own, a single car can be trained by millions of AI models. Consider the case of Tesla.

(ii) Language Recognition: Deep learning is still in its early stages, but smartphones can now distinguish between different dialects. A machine, for example, will compute and determine that a person is speaking in English. The dialect will then be used to make a decision.

(iii) Face Recognition: When you submit a photo to Facebook, the platform employs facial recognition algorithms to identify the persons in the photo and then assists with tagging the person based on their facial traits. Face

recognition technology is used by several governments across the world to identify and apprehend fugitives. You may now use your face to unlock your smartphone.

(iv) Image Recognition: One of deep learning's greatest achievements is the capacity of software to recognize places, people, writing, and actions in photos when used in conjunction with a camera and artificial intelligence software. Consider Google Lens, which can recognize and search for objects.

Some of the most widely used Deep Learning Architecture

(i) AlexNet: Geoffrey Hinton and his colleagues introduced AlexNet as the first deep learning architecture in deep learning. It's a simple but reliable network architecture that paved the path for ground breaking Deep Learning research (Figure 5). The scale at which this model accomplishes the task, as well as the utilisation of GPU high compute capacity for training rather than CPU, distinguish this model. In the 1980s, a neural network was trained using a CPU. AlexNet, on the other hand, increased training by ten times merely by employing GPU.

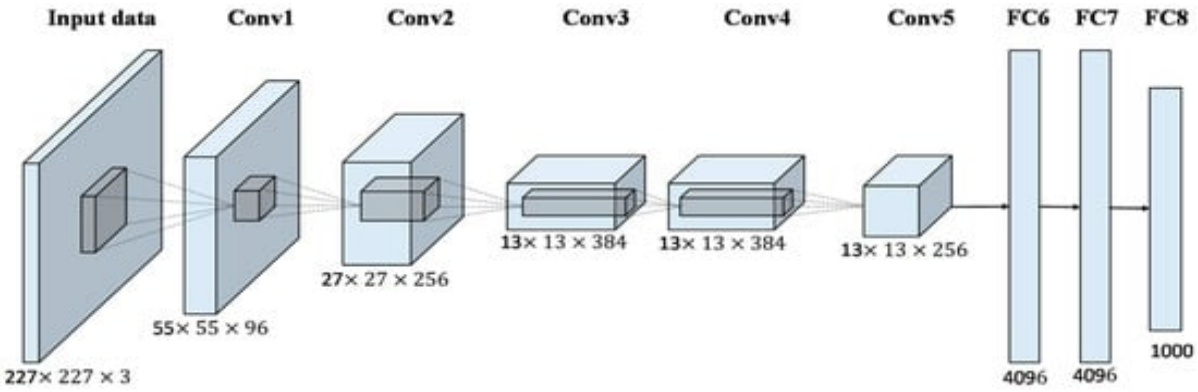

Figure 5: AlexNet (Murthy, *et al.*, 2020)

(ii) GoogleNet: Google Net is a type of architecture created by Google researchers (Figure 6). The winner of ImageNet 2014 was GoogleNet, which showed to be a powerful model. The researchers created a revolutionary technique dubbed the Inception module in this design; in addition to going deeper (it has 22 levels against 19 layers in VGG (Visual Geometry Group).

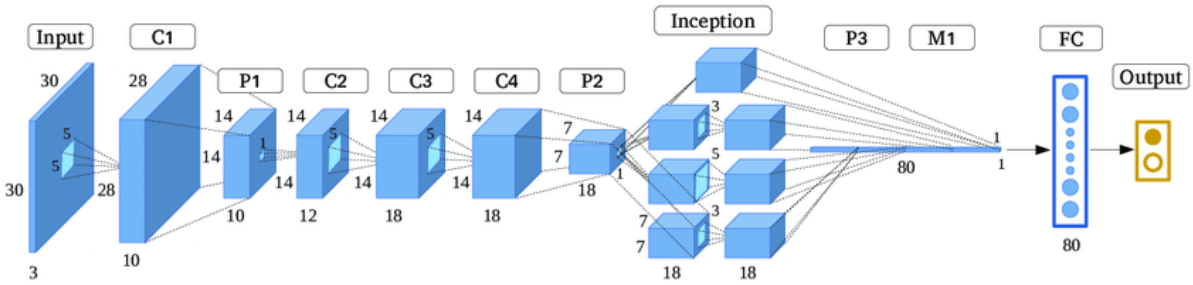

Figure 6: GoogleNet (Nieva, 2017)

Multiple types of feature extractors are present in a single layer and deleting a single lead result in a significant reduction in accuracy. This helps the network perform better in the long run because the network at training has a lot of possibilities to pick from when tackling the assignment. It has the option of either convolving or pooling the input.

(iii) Region Based Convolutional Neural Networks (RCNN): The most significant of all the deep learning architectures that have been applied to object detection problems is claimed to be the Region-Based CNN architecture (Figure 7). RCNN attempts to construct a border box over all of the objects present in the image in order to tackle detection problems, and then recognises which object is which in the image.

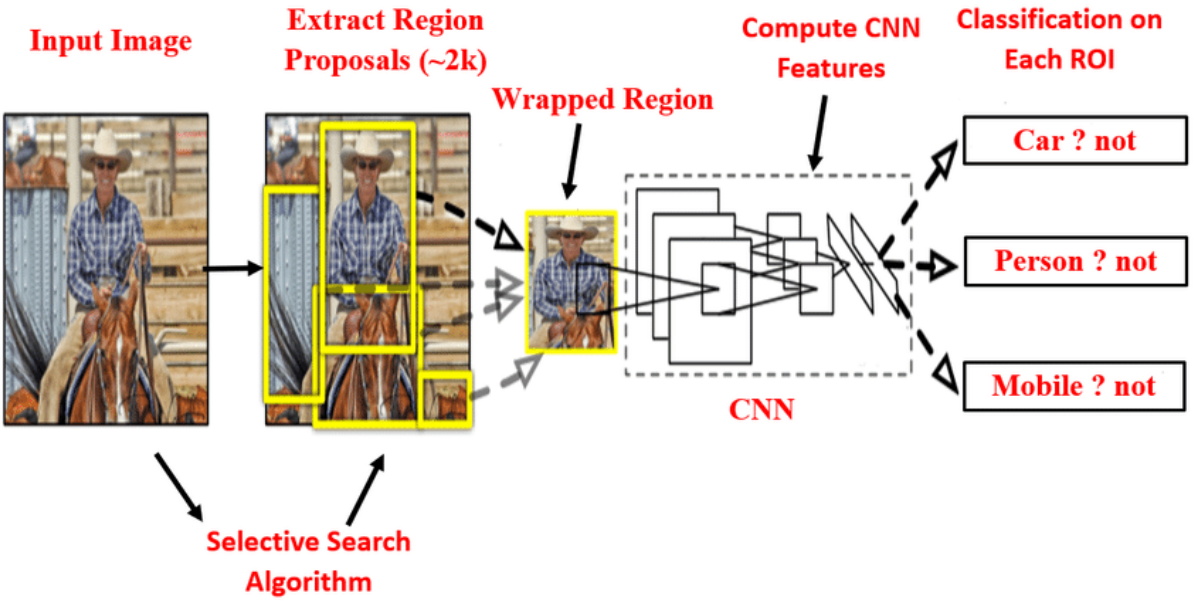

Figure 7: RCNN Architecture (Murthy, *et al.*,2020)

Image Recognition

Image recognition is an excellent project for developing and testing machine learning algorithms in the future. But how are we going to accomplish it? What is the process by which the brain converts the physical thing in front of our eyes into a mental model of our environment? No one, we believe, knows exactly how our minds work. The idea is that it appears to be simple for us to accomplish, so simple that we don't even have to think about it, yet it is tough for computers to do.

Tensor Flow, Google's open-source machine learning technology, is used by Google Lens. TensorFlow aids in the matching of photos to the best words to explain them. The algorithms then link those labels to Google's Knowledge Graph, which has tens of billions of image-clicked data that are searchable via Google.

The way we use cameras is not the only thing that is changing; the technology that powers them is also changing. Google Lens can read and let the users act on the words one can see to make this feasible. Users can, for example, aim their phones at a business card and add it to their contacts list, or copy ingredients from a recipe and put them into your grocery list. It might be difficult to tell the difference between characters that look identical, such as the letter "o" and zero. Google Lens employs Google Search's language and spell-correction algorithms to figure out what a character or word is most likely meant to be. For example, much as Google knows to correct bannana to banana, Google Lens can figure out that c00kie is most likely meant to be cookie. Google lens uses a deep learning library called TensorFlow that consist of multiple machine learning algorithms.

Google's TensorFlow is currently the most well-known deep learning package on the planet. Machine learning is used by Google in all of its products to improve the search engine, translation, image captioning, and recommendations, making them more efficient. When given a large amount of data, deep learning began to surpass all other machine learning algorithms a few years ago. Google realised it might improve its services by utilising deep neural networks to forecast and provide people a better experience when using their products: Gmail, Google Photos, and Google Search Engine are all Google products.

TensorFlow architecture has three stages. While the first stage pre-processes the data, the second stage builds the model. The third and the last stage trains and estimate the model (Figure 8).

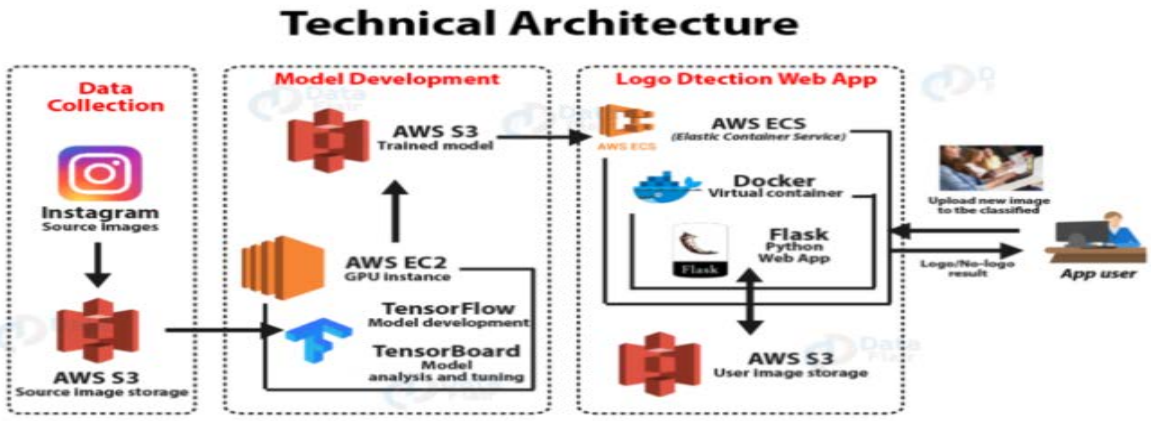

Figure 8: TensorFlow Architecture (Okumus, 2013)

4. Objectives and Methodology Employed

The objectives of the present study are (i) To understand the power of Google Lens; (ii) To understand the benefits of Google Lens over traditional procedures; (iii) To create awareness regarding the benefits of Google Lens in enhancing information services; and (iv) To create awareness among information professionals and users regarding the use of Google Lens as a single search platform for the required resources.

The study has employed qualitative analysis of the literature and observation that seeks to understand the application of Google Lens for ensuring the better services to patrons and to put forward the authors perceptions based on observation and experience. For this, various studies have been investigated. The inclusion criteria include studies that have been recently concluded on topics that are in conformity with the objectives of this study. Only recent literature in English has been considered. Studies on other aspects of Library and Information Science (LIS) and uses of Google Lens other than what has been mentioned in the objectives of the study have been excluded. The study intends to review part of the literature put forwarded by the experts in various forms. It also tends to identify the range of application of Google Lens in promoting information services beyond the traditional techniques which have been in use for almost a century in a large number of public, school, academic and special libraries all over the world.

5. Information Services in the 21st Century

People traditionally go to the library to read books, magazines, and newspapers, as well as locate maps of locations. The library is a must-visit

location for students in universities. Students can receive past-exam questions, CD-ROMs, cassettes, or video CDs from the library. It is a gathering place for students to socialize and discuss issues. At the library, a learning process has been established. The library is where thoughts and knowledge are exchanged. People also utilize the public library as a place to gather as a community, and they use it as a location to visit on weekends. In the library, a reading culture has been established. In the library, both children and adults enjoy reading. They have discovered that, aside from bookstores, the library is the best location to go for decent reading materials.

Almost every library in the world is undergoing a shift from a traditional library to a digital library. The construction of a digital library necessitates collaboration from all sectors, including government and non-government organizations, in order to promote its creation and use. To support additional digital projects, basic infrastructure for connectivity and interoperability, including financing, human resources, training, and leadership, must be in place (Peyala, 2011). In order to provide digital records and services to users, librarians must face numerous hurdles and exert considerable effort. Library administration must take on additional responsibilities in order to maintain libraries as significant institutions for preserving information heritage and knowledge resources.

Another difficulty for most libraries is the advancement of information technology. The majority of organizational activities and processes now rely on IT equipment such as computers, the internet, and Wi-Fi connections. According to Mohammad Dasuki Shak and Sharif Mohammad Shad (Poll, 2003), the library is provided with Wi-Fi internet connection, allowing students to use their own mobile phones or computers to access the web OPAC site inside the reachable area of the library building. According to Mohammad Dasuki Shak and Sharif Mohammad Shad (Sahak and Saad, 2011), creative IT development changes the library's scenario in terms of collecting media and information resources to meet user needs. The growth of technology in the library environment is thought to have begun with the publication technology, in which libraries print information sources and monographs. According to Roswitha Poll (Poll, 2003), most libraries report their performance in terms of input and output data. While input data includes revenue/expenditure, collection size, personnel numbers, research locations, and user space, circulation, reference transactions, interlibrary loan/document delivery, user training, and attendance at events are included in output data.

The expansion of library resources necessitates the expansion of library space. Space has always been an issue in college and university libraries, as

Robert A. Seal (Seal, 2015) points out: how it is designed and used; where services are located; how materials are stored, displayed, and made accessible; where staff and service points are placed; collection growth needs; furnishings and equipment need, use of technology, and so on. In addition, Danuta A. Nitecki and Eileen G. Abels (Nitecki and Abels, 2013) have also identified space in the library as one of the input factors influencing the library's perceived value.

The libraries in the twenty-first century are different from the traditional libraries. Various factors have contributed to the change in the nature and structure of the libraries in the twenty-first century. The subsequent sections look into some of the contributing factors.

(i) Technological Advancements

Many new items have been related with the enhancement of library services and management in the realm of advancing technology in libraries. The library began to implement new features in order to provide information and expertise to its patrons. The library website, for example, may not appear to be very attractive to users. However, with the increasing rise of information-based engines, they can now be coupled to websites, giving them a fantastic look and feel. It is more user-friendly and simpler to browse, according to users. RFID, automated checkout systems, and online databases are examples of good technology that can assist the library in meeting the needs of its patrons. Furthermore, the new cloud computing technology is beneficial to libraries. Cloud computing is a method of computing that makes use of a network of remote servers connected to the Internet. In this instance, the website's data is saved in a remote location. The contents of a library's website can be simply stored in the cloud system, and the website's administration can be done remotely from anywhere at any time.

(ii) Digitalization

The library's collection contains a wealth of information and wisdom. As we all know, the library has far too many tangible collections. It necessitates a lot of space. Most libraries have been digitalizing their collections since the year 2000. The act of transforming physical documents such as sound, paper, or images into an electronic digital form that can be read by computers and other electronic devices is known as digitalization. The records will then be made public on the Internet. One of the key goals of this effort is to maintain the library's physical collection. The library has implemented an added-value service for its users by using this mechanism.

The digital form of library resources can be converted to.pdf, .jpeg, or .bmp formats. This approach to library collection management is more

controllable. In terms of space consumption, all collections are stored on a server, which may be accessed via the library website once the indexing and cataloguing stages are completed. In order to keep the records safe, backups must be made. Internal and external backups are both possible.

(iii) Building and Facilities

Presently, a library's duty includes more than just providing study space and the ability to borrow books; it also includes services that go beyond what was previously available. Users' requirements and interests drive the evolution of facilities and services. The library has evolved into a hub for research and social interaction. With the current technological trend, libraries now offer a variety of new services, such as Wi-Fi access. This goes hand in hand with the library's digital offerings.

Any other department can use the library's discussion room and classrooms for their group discussion or workshop. For example, the Petronas Resource Centre provides rooms in the library for other departments to hold events or even a formal launching ceremony. In today's library, computer training rooms, career counselling services, a café, and a place to do homework may be included.

The change in the structure of the libraries has also brought in a change in the role of the librarian. The role of the librarian has changed from the traditional lending and receiving books, maintaining a catalogue of books, and maintenance a record of books etc. In today's environment, librarians are considered as knowledge managers rather than just cataloguers who rearrange books on shelves. Librarians have the authority to provide reference services as well as data management. In today's library, being knowledgeable is essential. In terms of technology, they must be able to assist users in their search processes while also having a thorough understanding of the subject matter in library collections and institutional repositories. In an interview, Katherine Stevens (Stevens, 2022) outlined five criteria that best identify librarians in the twenty-first century. These include (i) User engagement, (ii) Library collection appraisal, (iii) Scholarly communication ecosystem, (iv) Research analytical abilities, and (v) Scholarly integrated.

Some of the benefits of a digital library could be listed as follows: (a) No physical boundaries, (b) Availability at any time and from any place, (c) Document preservation, (d) Increased library awareness, (e) Added value to the contents, and (f) Effective use of space.

"Social touch-points with enriched collections for learning and bridges for involvement with arts and culture" are the goals of the next generation of

public libraries. This focus could lead to increased intellectual and creative output. The library's role as a quiet location for reading and thought is crucial, but as emphasized by the library's management, it should evolve new duties. Younger people want to see more open minds in the library, connecting physically and digitally over a variety of ideas and creative impulses.

6. Use of Google Lens in Information Services

This is among the first attempts to study the benefits of using Google Lens over traditional approaches to enhance library services. Since inception, libraries were institutions visited by users regularly to seek information. The development of internet technology and telecommunication in the last few decades together with the development of data processing, information retrieval, and management information systems have ushered in major shift in the functions of libraries (Sahak, and Saad, 2011). Libraries are still in the ongoing process of digital transformation and evolution to help them survive in the metaversized environment. The behaviour of the users has changed and libraries have no option but to adapt themselves to the new situation. The modern generation is tech savvy and wants information to reach their doorsteps rather than being confined within the four walls of the libraries (Stevens, 2015). The libraries are left with no option but to bring in new technology that provides innovative information. This will help them to retain their client base and also increase it. Library services need to change in order to cater to the change in information seeking behaviour of the users, their increasing demands and expectations with the use of technology that helps in making information accessible and available (The Times of India, 2019; Townsend, 2017). Google Lens offers a host of benefits that can truly enhance library services.

The increase in the number of productions, both in physical and electronic form has compelled the libraries to adopt computerized services to cater to their clients. Compared to manual services, computerized services are fast, easy to use, and save time and labour (The Times of India, 2019; Villas-Boas, 2017). Google Lens offers a host of innovative solutions to enhance library services. Constraints in time and space deny elaboration of all facets of Google Lens. This paper, therefore, makes an attempt to discuss a few of the techniques of library services that can be replaced and/or enriched by Google Lens.

(i) Quick Response Code: Quick Response (QR) Codes can encode different forms of data, especially texts, Uniform Resource Locators, and text messages. Quick Response readers must work with texts and URLs (Villas-Boas, 2019). QR codes are indispensible for libraries as these

help in quick retrieval of information. There are several methods of generating and reading Quick Response Codes (Walsh, 2009) with the availability of free online Quick Response Code generators. Google Lens allows seamless reading of the Quick Response Codes and this feature can enhance information retrieval in libraries. QR can be used not only in the field of information retrieval, but also in the field of common and everyday services of libraries. The loan service, for example, can be upgraded by this technology. Users can take the resources they need from the shelf on their own and get in front of an eye that benefit from this technology. Physical and digital resources can be equipped with QR codes. In this way, users can manage the borrowing of resources (check-in and check-out) by themselves. As a result, librarians' time is freed and they can use their expertise and focus to increase the quality and quantity of reference and information services.

(ii) **Digital Library:** In digital libraries all reading material are preserved in digital format. Computers and computer networks form the infrastructure or backbone of the digital libraries (Sahak and Saad, 2011). Preserving and archiving ancient manuscripts is a difficult task for every library. Libraries around the world have been scanning old documents. The differences in writing patterns sometimes make the scanned copy illegible. Various repository software packages are being used to cater to the different needs of the users (Xu, 2014). These repositories provide platforms that archive digital contents for helping the users in their process of research and learning. Features in Google Lens can do away with several repositories and easily convert physical texts into legible electronic formats. As a service that will be interpreted in line with the development of libraries and information centers, librarians can use this technology to touch the new frontiers of digital humanities. In the field of digital humanities, specialists in history, archeology, literature and linguistics process old texts and sources. They need expert help from librarians and programmers. Many libraries have the same resources in their print and digital collections that are needed by digital humanities specialists. Librarians can help process the raw materials of digital humanities researchers using the technology introduced in this article.

(iii) **Automation:** Google Lens is an excellent way of automating the library services. Tasks such as acquisition, cataloguing, management of stocks and serials can be eased using Google Lens. The Quick Response Code reading feature of Google Lens allows for finding information regarding the publisher, price, checking duplicity, among others. It also helps in

cataloguing the published materials. Google Lens can also help libraries in remote locations access the bibliographic and full-text databases of bigger libraries. Google Lens can also pave the way for grounding of online cataloguing systems that would provide cross references, notes and all other information regarding library materials. Classification of published materials can also be done using Google Lens. The ability of Google Lens to read barcodes would enable ease of transaction. Google Lens will help in matters of issue and return, reminder of overdue, registration of membership, reservation of books and other documents. In general, this technology should be used to automate and simplify any manual or semi-automatic process. In a situation where artificial intelligence narrows the field for libraries every day and convinces enthusiastic users of technology more and more that they can meet their needs without going to libraries, no efforts should be made to strengthen and promote library services. The truth is that library services have added value that expert systems do not offer. So the only logical decision is to use this technology to simplify the current procedures of libraries and bring back users.

(iv) **Stock Verification:** Google Lens's ability to read barcodes will help in stock verification. Fed into the data in the automation software, the barcodes read by Google Lens will give an idea regarding the books available and the books lent to users. In this way, the number of lost books can be ascertained. This aspect of the discussed technology is especially suitable for university libraries. Many university libraries are several decades old and have collections of hundreds of thousands of books and magazines. Managing this massive amount of resources, which are mostly kept in separate tanks, is a difficult task. In academic libraries, different parts of the repository and even different storage are considered for storing and processing resources in turn. Due to the high volume of use of library resources, there are always a large number of printed resources that need to be restored and bound, or financial considerations related to their loss or theft should be taken into account. All these fields have the capacity to enter this technology and facilitate processes and services.

(v) **On-line Public Access Catalogues (OPACs):** Many libraries have opted for this form of cataloguing which does away with maintenance of a physical catalogue. This catalogue provides the users the benefit of viewing the availability of their required reading materials on a real time basis. But this technique requires the use of barcode scanner. Google

Lens reduces the cost of purchasing such scanners and eases preparation of such catalogue. Currently, companies that develop library software are trying to integrate their software packages with other common programs and devices in the market. One of the current goals is to develop library software in such a way that it can exchange data with intermediary tools of other systems.

(vi) **Reproduction of Documents:** Libraries have been using scanners and photocopiers to reproduce documents. These machines are costly and out of reach of smaller libraries. The ability of Google Lens to take pictures reduces the expenditure on capital assets and allows easy reproduction of documents. It is also beneficial to the users as they can reproduce certain portions of the documents for their use. This service is completely similar to the service that smartphone users get from some applications. For example, a program that allows users to scan any document has greatly reduced the hassle of visiting offices that have professional scanners and the cost of using this service. Examples of this service include photo and video editing applications. All of these services are specific content production, which today's smartphone technology has made them very simple and cheap. Google Lens technology can be used in the same way.

(vii) **Document Delivery:** Financial constraints and lack of space are major reasons that prevent procurement of all resources that are being published globally. The panacea of this problem lies in exchanging such resources in digital form. This process requires converting the document into digital format and sending these via electronic mail. This helps in catering to a large number of users and also saves on space and finances (Murthy, *et al.*, 2020). Google Lens can help in converting documents into digital forms for sending these to prospective libraries. Based on this technology, users can submit their requests to document delivery systems, and in return, the system can respond to the request by scanning and confirming a code. This technology can help to digitize documents that can be delivered and make it possible to use the resources and services of document delivery without going to the library in person.

(viii) **Translation Services:** Translation services are among the major services provided by the global libraries. Before the arrival of computers, translation was done by translators who were specialized in this field. With the publication of numerous documents in different languages, libraries have used online translation tools to translate documents into

several languages (Murthy, *et al.*, 2020). The translation capability of Google Lens can help libraries translate several documents in foreign languages into known languages without any external software. The importance of this service can be understood when we consider the large and diverse collections of academic and national libraries; where resources from different languages can be seen in different subject areas. Certainly, the library service should be offered with the aim that users have the opportunity to use the content of all resources regardless of the language of the documents and their ability. The technology introduced in this article allows librarians to translate a diverse and wide range of resources in common and even rare languages into one or more main and well-known and understandable languages for users. If we keep in mind that language diversity is also visible among users, then we can better understand the benefit of this service.

(ix) **Database Search:** Bibliographic databases have been in use for a variety of research studies. The use of Intensive computer technology has made the process of search and retrieval of online resources very fast and easy. Mentoring researchers on matters of database search is one of the services that are provided by the libraries (Murthy, *et al.*, 2020). The search facility in Google Lens can help researchers search for relevant material in the databases to save time and energy. We should think about the possibility of how Google Lens technology will improve the quality of services in connection with the user interface. We currently have access to hundreds of databases. But not all databases have user interface in English. Google Lens technology may help librarians design at least more understandable user interfaces for users.

7. Conclusion

This study makes an attempt to understand and create awareness of using Google Lens to improve library services. Google Lens is an Artificial Intelligence powered technology and has tremendous possibilities. The study has noted that Google Lens has the capability of copying text from the real world, sending text from the real world to the users' computer, hearing text from the real world read loud, interacting with text from an image, searching for text from any physical document or image, creating a calendar event, saving someone's contact information, Emailing, calling, texting, or navigating to a website, translating text from the real world, and scanning barcodes and QR codes.

The strength of this study lies in understanding the nature of library services and putting forward a pathway for migration from traditional ways to automated ways as per the conclusions arrived at by extant studies. However, certain aspects of library services may not find a place in this study which is a major limitation of this study. Future studies may look into the aspects left behind and build upon this study. Further, the potentials of Artificial Intelligence and Machine Learning are tremendous and these features would certainly be incorporated into the Google Lens in the near future. Consequently, this technology will give the library users a better experience.

Effective implementation of the power of Artificial Intelligence in libraries ushers in satisfaction amongst the users. The present era warrants use of efficient technology that can herald faster and accessible library services. New technologies are being developed, requiring development of our skills and ability at providing enhanced library services. The resources present in every library must be used at the optimum level. The success or failure of a library and the professionals involved depends on their ability to provide quality service to the users. The emergence of Artificial Intelligence is the new paradigm that can enhance library services. So, it is necessary that the library professionals update themselves for their own survival. In short it can be concluded that the application of such technology must be welcomed whole heartedly by the professionals to justify their existence in 21st century and should be explore to find opportunities to provide better services to the end users.

However, the dangers of artificial intelligence as the backbone of this technology should not be overlooked. There are several risks to consider. For example, artificial intelligence has put humans in a fragile state where they may consciously or involuntarily harm themselves and others at any moment. This risk covers all areas of application of artificial intelligence including how to use it in modern library services and information centers. Even inadvertent mistakes may disrupt the service or threaten the confidential identity or privacy of users. In addition, we must consider the economic risk of using this technology. Although the use of artificial intelligence has made the processes simple, fast and cheap, this technology is ultimately based on an expert system that can analyze up to the limit of meaning. This means that the power of analysis and inference is not unlimited. This technology is limited in understanding words and images. No matter how much we strengthen the knowledge repository of an artificial intelligence system, there are still different meanings and interpretations that the system cannot understand. The decision-making system of expert systems and artificial intelligence works within the framework of their power of inference and understanding. Hence, any decision or suggestion made

by this technology on the library service desk is based on a limited processing engine and cannot be decisively applied or recommended as a quick solution. Therefore, the final claim of this article is that the high capacity of technology should be used for the development of library services. But as long as expert systems and tools are one step behind their developers, they should not be entrusted with the entire process of designing and providing services.

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