VISUAL OBJECT BASE INFORMATION RETRIEVAL USING DEEP LEARNING & KNOWLEDGE GRAPH

A PROJECT REPORT

Submitted by

SREELEKSHMI JL

[SCM20MCA-2027]

to

The APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Master of Computer Application

Department of Computer Science and Engineering

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

(*Affiliated to APJ Abdul Kalam Technological University*)

VIDYA NAGAR, PALISSERY, KARUKUTTY

ERNAKULAM – 683582

July 2022

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

(*Affiliated to APJ Abdul Kalam Technological University*)

VIDYA NAGAR, PALISSERY, KARUKUTTY

ERNAKULAM – 683582

CERTIFICATE

This is to certify that the report entitled '**VISUAL OBJECTBASE INFORMATION RETRIEVAL USING DEEP LEARNING & KNOWLEDGE GRAPH'** submitted by **SREELEKSHMI JL** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of computer Application is a bonafide record of the seminar work carried out by her under my guidance and supervision.

GUIDE
Ms.Rosebell Paul

HEAD OF THE DEPARTMENT
Dr Varun G Menon
Professor
Department of CSE

PROJECT COORDINATOR
Ms. Deepasree Varma

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

I am greatly indebted to Dr. Praveensal C J, Principal, SSET, Ernakulam, and Dr. Varun G Menon, Head of department, Department of Computer Science and Engineering, SSET, who whole heartedly granted me the permission to do the project.

I would like to thank my external guide, Dr. Shailesh Sivan, Assistant Professor, Department of Computer Science, CUSAT who has given me valuable guidance and support.

I would like to thank my guide, Ms. Rosebell Paul, and project coordinator, Ms. Deepasree Varma, Department of Computer Science and Engineering, SSET who has given me valuable guidance and support all the way.

I would like to express my sincere gratitude to all the teachers of the Computer Science Department who gave me moral and technical support. I would like to thank the supporting staff in the computer lab whose dedicated work kept the lab working smoothly, thus enabling me to have access to various resources which helped me understand more about the project topic. I would also like to thank friends and family members for providing me with necessary resources and support. Last but not the least, I would like to thank God Almighty for helping me to do my project hassle free.

ABSTRACT

Completion of the knowledge graph (KG) is the creation of the knowledge graph and related applications aimed at completing the structure of the knowledge graph by predicting what is missing Mining of knowledge graph entities or relationships and unknown facts. Starting from the definition. We analyze the types of KGC and existing technologies of KGC by category. From the development point of from a point of view, KGC technology can be divided into traditional methods and representation learning-based methods. The former mainly includes rule-based inference methods, probability graph models such as Markov logic, etc. Networks and methods based on graph calculations. The latter also includes translation model-based semantics Methods based on matching models, methods based on feature learning, and other methods based on neural network models. with this The article introduces a variety of KGC technologies, including strengths, weaknesses, and applicability fields. Finally, we will discuss the main challenges and issues facing KGC and their potential. Research direction.

Knowledge Graph (KG) has evolved into an interesting abstraction to organize the world's structured knowledge and integrate information extracted from multiple data sources. In addition, by expressing the information extracted by the AI system and providing the knowledge expressed in KG as input, it will begin to play a central role in improving the prediction of the AI system. Knowledge Graph embedding is organized according to four aspects of expression Spaces, scoring functions, coding models, and help information. Knowledge acquisition, especially the knowledge graph Completion, embedding method, path inference, logical rules Justified and checked. Also, meta-relational learning, reasoning, And the temporal knowledge graph. To facilitate future research the knowledge graph also offers a carefully selected collection Data sets and open source libraries for various tasks. Among them finally, let's take a closer look at some promising findings direction.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER-1

INTRODUCTION

1.1 GENERAL BACKGROUND

Data retrieval is the process of getting data out of a database management system, or DBMS. This is the procedure for locating and obtaining information from a database based on a request made by a user or application. Information is the knowledge of a certain event or circumstance that is imparted or acquired.[1] Search is the process of looking through the information that has been saved for information relevant to the current task. In light of this, we manage information retrieval, display, storage, organization, and access. Documents, web pages, online catalogues, structured records, and multimedia objects are examples of the several sorts of information items that are covered here. The fundamental goal of IR is to index the text and look for relevant documents in the collection. One of the earliest organisations to adopt an IR was the library.

INFORMATION RETRIEVAL SYSTEM

The process of extracting information system resources relevant to information demands from a collection of these resources is known as information retrieval (IR). Searches may be based on full-text or other content-based indexes. Information retrieval is the science of finding information within a document, finding the document itself, and finding data, such as text, photos, or audio, as well as metadata that characterises the database. To lessen the alleged information overload, automatic information retrieval systems[25] are deployed. A software programme that makes books, periodicals, and other publications available is known as an information retrieval system. Save and handle these documents. The most noticeable IR application is web search engines.

To give consumers the finest data from the database, information retrieval serves this objective. The challenge with information retrieval is figuring out what information is suitable for a given user query. User queries are a popular interactive information retrieval style. These are employed by information retrieval systems to find information that satisfies user demands. Users could be interested in discovering papers on a specific topic in a bibliographic database, for instance. The keywords that were taken out of the search query

are an effort to describe the subject, gauge accuracy (to ensure that a large portion of the results are pertinent to the user), and assess recall (related elements).

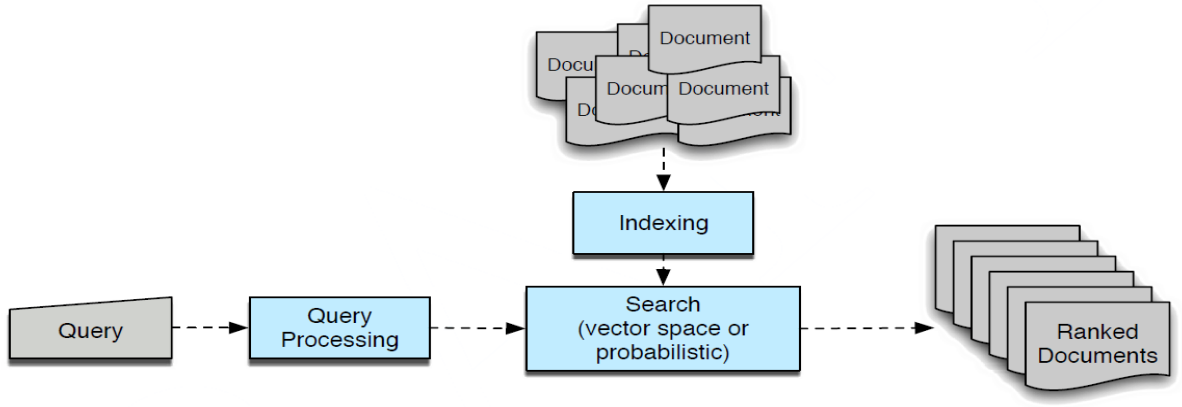


Fig 1.1 shows the process of image retrieval systems

Three types of information model (IR) models can be distinguished: - Classic IR model This model is the simplest to implement. This paradigm is built on simple to observe and comprehend mathematical concepts. Classical IR models include boules, vectors, and probabilities. a non-traditional IR model The classic IR[25] concept is completely at odds with this. Unlike similarity, probability, and Boolean operations, these IR models are founded on different ideas. Examples of non-classical IR models include information logic models, situation theory models, and interaction models. Additional IR models By utilising certain methods in various additional areas, this model is superior than the conventional IR model. Cluster, fuzzy, and latent semantic models are a few alternatives to IR models.

Components and features of Information retrieval systems

1. Indexing inverted

Most IR systems use an inverted index as their fundamental data structure. A data structure that includes all the papers that contain a term together with how many times it appears in each one is an inverted index[26]. makes it simpler to search using the phrase "hit."

2. Stop word removal

High frequency terms known as stop words are unlikely to be helpful in your search. They carry little semantic significance. A list known as a stop list contains all of these kinds of words. Stop words include, for instance, the articles "a," "an," and "the," as well as prepositions like "in," "of," "for," and "at." The stop list may be used to drastically reduce the size of the inverted index. Zipf's law states that an extensive stop list cuts the size of the inverted index by approximately half. However, eliminating a stop word could also exclude terms that are pertinent to your search. For instance, it makes no sense to take the letter "A" out of "vitamin A." Stemming

Heuristic techniques that extract a word's fundamental form by trimming off the end of the word are a condensed version of morphological analysis. For instance, the terms "laughing," "laughs “and” laughed “are boiled down to the word” laughThere are three types of information retrieval IR Model:

1. Classical IR Model—The most popular IR model, it is based on fundamental mathematical ideas. Implementing conventional information retrieval models is simple. He uses vector spaces, Booleans, and probabilistic[25] IR models as examples. Information retrieval in this system is dependent on a document that contains a predetermined set of queries. No ratings or rankings exist. Different classical IR models consider document representations, query representations, and modelling capabilities for capture or correction..

2. Non-classical IR model – This model is based on propositional logic, which sets it apart from the classical model. Information logic, scenario theory, and interaction models are a few non-classical IR model examples.

3. Alternative IR Models - These integrate the fundamentals of traditional IR models, and include generalised vector spaces, fuzzy sets, possible semantic index (LSI) models, alternative algebra models, cluster models, alternative set theory models, etc. Adapt to a model that is more useful. creating models, etc.

IMAGE RETRIEVAL SYSTEMS

The technique of looking for digital images in big format image data using a computer to examine, look for, and retrieve those images is known as image retrieval. A computer system for exploring, searching, and retrieving images from a sizable library of digital images is called an image search system. [3]The majority of the conventional and typical ways to obtain a picture involve adding information to the image, such as captions, keywords, and descriptions to enable search functionality through the annotation language.

Manual picture annotations are laborious, expensive, and time-consuming. To overcome this, a lot of study has been done on automated picture annotation. Information related to images or the keyword label, for instance. Applications like fashion design, criminal prevention, healthcare, and architecture all require effective image collecting and acquisition. According on visual elements like colour, texture, and form, images are preserved.

Types of image retrieval systems

Text-based picture search, content-based image search, and semantic-based image search are presently the three main categories of image search system[23]s. The many kinds of picture search systems are briefly described below:

Fig1.2 shows the type of image retrieval

Text Based Image Retrieval : In this case, a text-based database management system is used to do a comprehensive search after first annotating the image with text. For this, text-based tags, keywords, or descriptions are employed. To find photographs that satisfy tag-based

criteria, users enter textual or numeric searches. A text-based [22]picture search framework is the name for this kind of framework..

Content based Image Retrieval : It is also understood to be a query on the image's subject matter. first made available in the 1980s. The photos in the content are automatically searched for throughout each experiment,[3] just using the database's image search. The key objective is to use such qualities to discover pertinent photographs. To achieve this, you must first profitably divide the information into segments and describe the content precisely. A query image's many characteristics are created when it is applied to the system. It then compares the characteristics to the different photographs in the database before showing the user the findings.

Semantic Based Image Retrieval : There is a gap between high level and low level picture characteristics called the CBIR Intensification. Human perception is always a phenomena. Search for Semantic Images The two phases of the software are construction phase and query phase. The semantics-based image search engine is able to distinguish the essential and fascinating pattern, region, or item based upon attribute that was derived by the visual low-level features during the development phase. In the query phase, you may use text or picture searches based on popular concepts to achieve semantic functionality.

Multimodal fusion image retrieval： Data fusion and machine learning algorithms are used in multimodal fusion picture searches. Data fusion, commonly referred to as proof combining, combines evidence from several sources. You may learn them by utilising a variety of methods. Effects like "skimming," "the chorus," and "the black horse."

Relevance Feedback Image Retrieval: User information requirements and visual representation differ in the following ways: It is referred to as the semantic gap in the CBIR system. limited picture search accuracy Due to flaws in their fundamental meaning, nuclear search methods are essentially useless.[2] The CBIR system benefits greatly from gap reduction and relevant feedback in order to achieve this. Fundamental mode of thought The purpose of the relevant feedback might be to incorporate human subjectivity into the inquiry. After that, let the user assess the search results. The integration then automatically modifies the similarity based on the user. Numerous CBIR algorithms have been presented, and the majority of them are successful at identifying particular photos or collections of images that

are connected to the query image. However, you must engage with your users if you want greater outcomes.

Relevance Feedback Techniques

Category	Relevance Feedback Methods	Advantages	Limitations
Statistical Based RF Methods	Delta Mean algorithm	Determines which features can efficiently differentiate between the relevant and irrelevant image examples	As small size cannot calculate exact variance of data set, so it is receptive to data set size.
	Standard Deviation and Variance	Bunch of relevant images exhibit the specific features and are inversely proportional to the relevant image set variance	It assumed irrelevant sample to be unimodal which is not actually possible.
	QPM (query point movement)	Estimates the perfect query point from which the ideal relevant images can be retrieved.	QPM unable to make better use of irrelevant samples when images are not unimodal.
Kernel Based RF Methods	Bayesian Frame work	Textual based image retrieval method is used extensively in this scheme. User interaction is always computed in terms of probabilities of a random variable.	When extraction of texture, shape and color features is done individually for retrieval of image performance evaluation using Bayesian models decreases considerably.
	SVM (Support Vector Machine)	SVM derived better results for pattern identification without dealing with the filed Information.	SVM sensitive to small sample data sizes.
	BDA (biased discriminant analysis)	Calculates the linear transformation for the scattered negative and positive images.	Gaussian distribution methods for relevant data set are the main flaw for the efficient results.

Table 1.1 Techniques of relevance feedback

Text Retrieval System

Unstructured text is transformed into a structured format using the text search process in order to find significant patterns and fresh perspectives. Companies may investigate and discover hidden links in unstructured data using cutting-edge analytical approaches like Naive Bayes, Support Vector Machines (SVM), and other deep learning algorithms. There are two methods for text searching: -

Document selection : The query is regarded as a defining constraint for picking related documents in the document selection procedure. The Boolean search model is a frequently used strategy in this field. In this architecture, the user gives a Boolean expression for each group of keywords that define the page. B. Database management systems, tea, coffee, and auto repair businesses. Oracle, however, is not covered. Such Boolean searches can be accepted by the search engine, which will then return entries that meet Boolean criteria. Boolean search approaches are often only appropriate if the user has a thorough comprehension of the document collection and can build the optimal query since boolean queries are complicated to define precisely what the user requires.

Document Ranking : The query-based document ranking approach ranks all records according to a relevant hierarchy. These approaches are superior to document selection for frequent users and exploratory inquiries. Today, the majority of data retrieval systems provide file ranks in response to user keyword searches. Numerous ranking techniques are based on different mathematical concepts, including algebra, logic, probability, and statistics. The underlying idea of all these strategies is that you may link the keywords in your query to the keywords in your records and rank each record according to how well it fits your query.

The objective is to determine a record's level of relevance using scores derived from data like word frequency in the text and across sentences. It is intrinsically challenging to determine how closely a group of terms are related. For instance, it is challenging to quantify the difference between data analysis and data mining. The vector space model is the most popular approach to this strategy. A vector space model's fundamental concept is as follows: For any keywords, query vectors, and record vectors with the proper similarity, both documents and queries may be represented as vectors in high dimensional space. The similarity score may then be used to rate your papers.

The Text retrieval System (TRS) is a well-known type of program in the field of informational documents, designed for searching text and related documents. The task of retrieving a database and a text search system is very different. Common information retrieval problems that traditional database systems do not have, such as: B. Unstructured documents can be addressed by searching for keywords and related terms. To avoid indexing useless words, the text search system associates a stoplist with a set of documents. Unlike traditional SQL queries in the database[3], the results of an information query may or may not match the rank of the query result. In general, the point is to represent the text system in a format that allows the request to be compared to the document. This means that the user needs a browser to access the latest records. In most cases, the same query leverages the capabilities of a text search engine available on your local network. The main challenge of text search is to define an answer set.

A preprocessing step for text searches is text indexing. Text is gathered, examined, and preserved throughout the text indexing process to enable quick and precise text search. Information is generally kept in text format in the information retrieval field of text search, sometimes referred to as document search. An exact match between a user query and a set of text is what is meant by a text search. The text is rated and presented to the user in accordance with its relevance to the user query as a result of the text search. A user's request for information may be expressed in as short as a few words or as a detailed, multi-sentence statement.

For document retrieval systems, there are two primary categories of indexing schemata: form-based (also known as word-based) indexing and content-based indexing. The structure of the document retrieval system is determined by the document categorization scheme (or indexing technique) in use.

Form based: Similar to substring matching in string searches, form-based document retrieval tackles the precise syntactic features of a text. The content is typically unstructured and not always in normal language; for instance, the system may be used to handle huge collections of chemical representations in molecular biology. A form-based indexing example is the suffix tree algorithm..

Content Base: The semantic connections between a document and some of it, as well as between a query and a document, are used in the content-based approach. A deindexing algorithm is used by the majority of content-based document search systems

1.2 ORGANIZATION OF THE REPORT

There are five chapters in the report. The report's opening chapter Background information and project organisation in general. Various literature reviews of the project are included in Chapter 2. The specific design and characteristics Chapter 3 provides a description of the suggested system. Results of the experiment are discussed in Chapter 4. The final chapter contains a summary of the conclusions. The prior chapter now includes the seminar's potential scope. Lastly, notice It's explained on the final page.

CHAPTER 2

LITERATURE SURVEY

Deep Convolutional Neural Networks (CNN) have recently established themselves as the industry standard for computer vision applications including object detection and image categorization. High-level feature learning is required for effective performance [Krizhevsky et al., 2012; Simonyan and Jisaman, 2014; Szegedy et al., 2015; they, 2016].

Areas with CNNs Function (R-CNN) [Girshick et al., 2014] and its fast variation employ CNN to categorise objects in previous research such object identification, relies on range suggestions that have already been computed to locate objects. CNNs are utilised for object localisation in addition to object categorization. The speedier R-CNN will introduce an area proposal network in particular, which effectively shares the convolution function. both classes and regional recommendations. It also makes use of broad-scale contextual data. Contextual functions have been studied to enhance object identification in order to more accurately categorise particular areas [Belletal, 2016].

Object detection meets knowledge graphs by Yuan Fang, Kingsley Kuan, Jie Lin, Cheston Tan, and Vijay Chandrasekhar Institute for Infocomm Research. From security monitoring to self-driving automobiles, object recognition in pictures is an essential application of computer vision. Deep neural networks and other cutting-edge algorithms now in use are primarily concerned with utilising picture characteristics.

Techniques for Image Retrieval: A Survey Here, K. Shubhankar Reddy and K. Sreedhar showcase some current work in image retrieval. The relevance feedback methods (RF) that are currently in use are reviewed in this work, along with an examination of retrieval systems based on these techniques for content-based picture retrieval (CBIR). For effective and reliable content-based picture retrieval, researchers. methods for retrieving images.

Knowledge Graph-Empowered Materials Discovery,by Xin tong zhao, Semion K. Saikin,It discusses studies on materials science prediction and invention using knowledge graphs. For the purpose of data discovery, extraction, and integration in materials science, we develop a knowledge-graph based technique.

Data Transformation Recommendation Engine Based on Knowledge Graph, Satoru Watanabe, Garima Natani, We created a knowledge graph-based data transformation recommendation system with a data similarity component to assist produce results that are easy to understand in order to address this issue. This recommendation engine makes it possible for novice developers with limited experience in current data transformation flows to complete data transformation jobs, speeding up ongoing improvement efforts.

Knowledge Graph Completion: A Review, related applications, which aim to complete the structure of knowledge graph by anticipating the missing view, the KGC technologies may be split into traditional and representation learning based approaches. The former primarily consists of rule-based reasoning techniques, probability graph models like Markov logic networks, and graph computation techniques. The latter additionally contains a translation model-based, semantic article, where several KGC technologies are described together with their benefits and drawbacks.

Methods based on CNN

Model	Defect/Improvement
convE [90]	The connectivity structure in the knowledge graph is not merged into the representation, and the contradiction between data size and overfitting cannot be achieved
SACN [94]	Remove the steps of reconstructing for the representation of entities and relationships in ConvE, and perform convolution filtering when the entity dimensions and relationship dimensions are the same, improve the performance of ConvE
GCN [93]	Extend the convolutional neural network to non-Euclidean graph
R-GCN [95]	Modeling for multi-relational data, as an extension of GCN from local graph neighborhoods to large-scale relational data

Table 2.1 method of CNN

Finding pictures from a big collection of photos known as the image database that are pertinent to users is the focus of content-based image retrieval systems, according to Dr. Venkat N. Gudivad. a piece of software that makes it easier to find images.

Knowledge Graphs: A Perspective from Information Retrieval, Ridho Reinanda, Maarten de Rijke, and Edgar Meij This article provides an overview of knowledge graphs and the environment around information retrieval.This comprises tasks like relation extraction, entity identification, and typing.

CHAPTER 3

PROPOSED SYSTEM

Using deep learning techniques and knowledge graphs, the key elements of diverse picture retrieval were examined in this study. When an image is uploaded, the programme analyses the things it contains and retrieves both textual and visual data about them.

A method for finding a picture from a database based on the data it contains is called visual information retrieval. A computer vision method called object recognition is used to locate occurrences of things in pictures or movies.[17] For the community of computer vision researchers, finding pertinent photos in the archive is a difficult research problem. Based on keyword matching, the result may include photos that aren't relevant. Finding unstructured content that satisfies information demands from many sources is known as information retrieval.

DATASET

The dataset consist of 80 classes and which is in the jpg file format and total 3285 images . So, this work we had chosen a subset of dataset as follows:

- **Bicycle**
- **Bird**
- **Boat**
- **Cars**
- **Cats**
- **Dogs**
- **Horses**
- **Human**
- **Keyboard**
- **mouse**

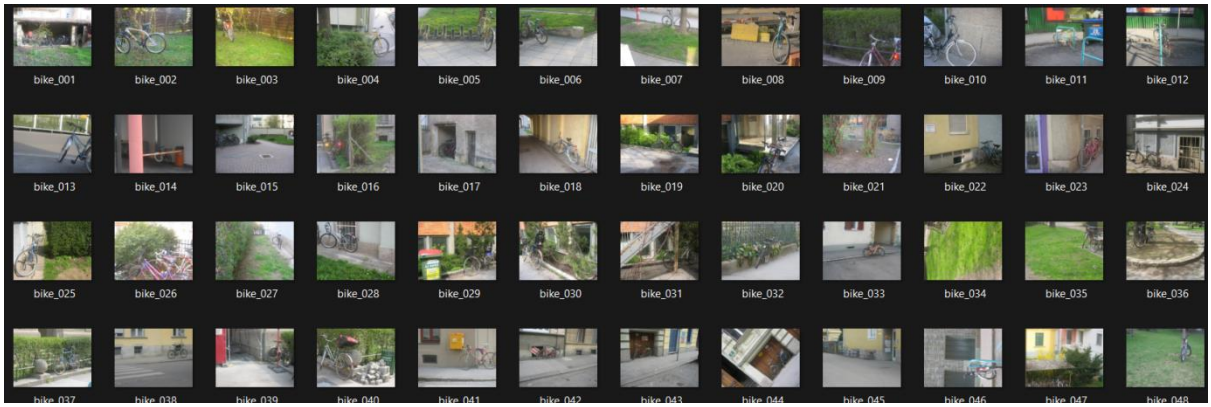


Fig 3.1 dataset object

3.1 METHODOLOGY

PRE-PROCESSING

Since the majority of the photos in the dataset are in GBR format and just a small number are in other formats, every image has been converted to RGB in order to maintain consistency. That is the converting the GBR to RGB.

Resizing the image to 256 width and 256 length.

Extracting the keywords from the text

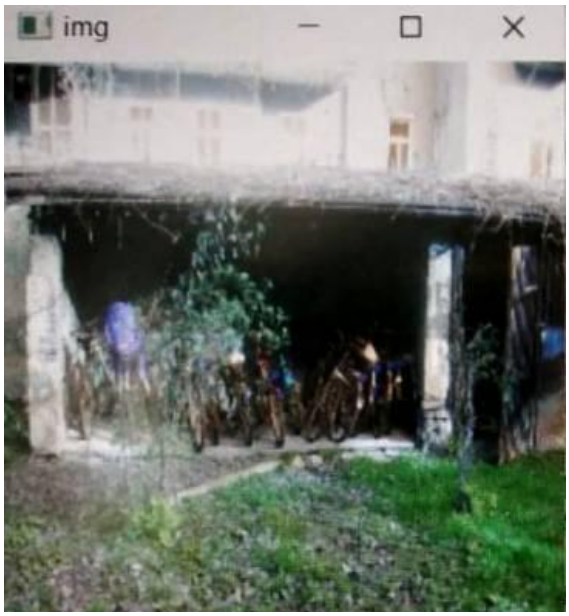


Fig 3.2 output of resized image

Feature Extraction

The primary benefit of deep learning is the elimination of the requirement for manual feature extraction from images. During training, the network picks up how to extract features. ie,

checking whether it has punctuations, subject, commands and removing it.while training, check whether the text has any punctuation and subject or verb that is extracting the entities and images are predicting with the model.

In detecting time , we got the bounding box, confidence and the label.

Bounding box is the x,y coordinate to plot a

Confidence is the how much percentage is sure about the object is a specific object.

The high level architecture as follows:

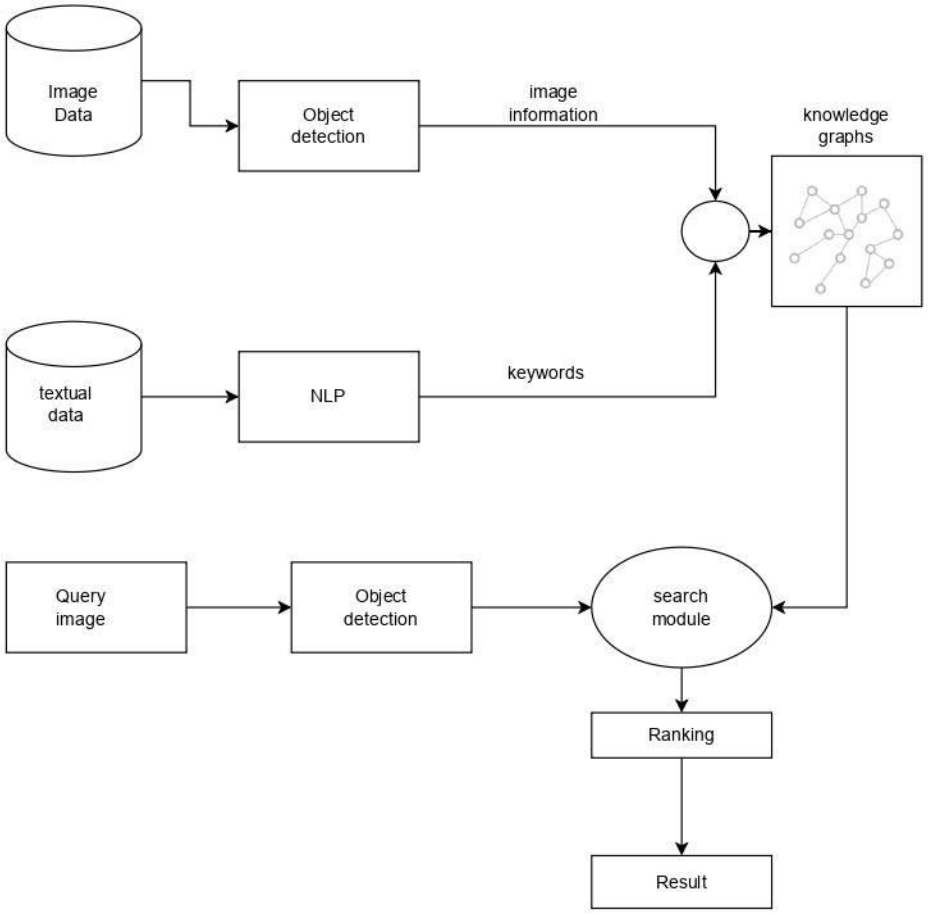


Fig 3.3 High level architecture

3.2 Proposed solution

Knowledge Graphs

A network of actual entities is represented by a knowledge graph, sometimes referred to as a semantic network.It displays a thing, a thing happening, a thing happening, or a notion together with their connections.[4] In a graph database, this data is often saved as a graph structure. a database because you can use structured queries to study the data. Google initially

introduced the idea of a knowledge graph in 2012. It is described as a large knowledge base made up of several things and the connections among them..

Fig 3.4 example

In recent years, natural language processing, intelligent question-answering systems, intelligent recommendation systems, and other applications have made extensive use of the knowledge graph as a semantic network. Three primary elements make up the knowledge graph: nodes, edges, and labels[5]. A node can be any kind of thing, place, or person. The connections between nodes are determined by edges. An agency like Ogilvy or a client like IBM are two examples of nodes. The fact that IBM and Ogilvy may categorise this connection as a client relationship is advantageous. The knowledge graph has evolved into one of the driving engines behind the advancement of artificial intelligence, much like deep learning.[6] A large-scale intelligent system that integrates knowledge and data is what the knowledge graph is supposed to be the information.

Google's knowledge graph was designed with two primary goals in mind:

1. Aiding users in making the proper choice (by understanding their intent)
2. Compile stuff that is similar.
3.Offers more thorough analysis of questions.

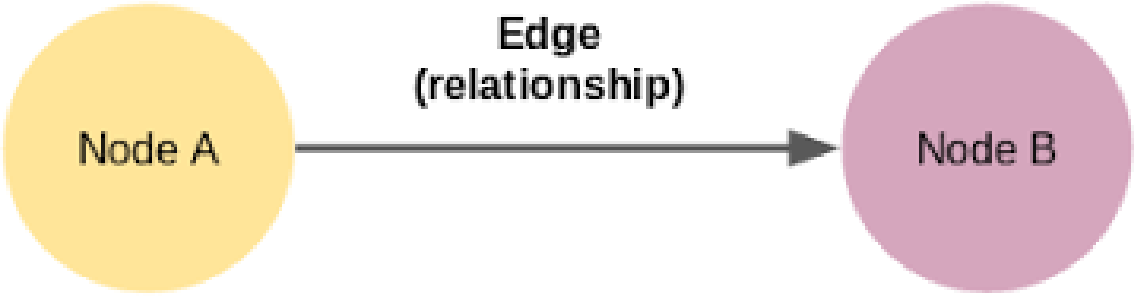


Fig 3.5 relationship between nodes

How a knowledge graphs works?

Knowledge graphs may have various architectures and typically consist of datasets from many sources. Together, schemas, identities, and contexts offer several types of data structure. The context establishes the setting in which that information is found, the IDs correctly categorise the underlying nodes, and the schema offers a foundation for the knowledge graph. Words with numerous meanings can be distinguished thanks to these elements. This enables you to distinguish between fruit Apple and Apple goods in things like Google's search engine algorithms.

Natural language processing (NLP) is used in knowledge graphs driven by machine learning to generate semantic enrichment, which is a complete representation of nodes, edges, and labels. Once the data has been digested, this procedure enables the knowledge graph[7] to distinguish between distinct items and comprehend their relationships. Then, other relevant, comparable datasets are compared to and integrated with this practical knowledge. The question-answering and search system will be able to get and reuse thorough responses to a given query once the knowledge graph is full. While time may be saved by using consumer-focused goods, the same technology can also be used in corporate settings, doing away with the need for manual data integration and collecting to support business decisions. Becomes the associated data integration initiatives.

The knowledge graph mostly benefits from the following factors:

1. Combine Isolated Data Sources: To receive a comprehensive perspective of all your information, the Knowledge Graph enables you to combine various data silos.

2. Combining structured and unstructured data: Compiling documents or Excel spreadsheets is only one aspect of data collection[8]. With the use of knowledge graph technology, many data types may be meaningfully integrated, offering richer data services than conventional knowledge management systems.

3. Relationship Summary: The Knowledge Graph swiftly and effectively describes relationships, making it scaleable to handle additional data.

4. Learning from Hierarchical Data: The Knowledge Graph is useful for learning from hierarchical data.

5 Using the knowledge graph is another excellent technique to visualise the flow of information.

CLASSIFICATION

The knowledge graph's categorization may be seen from the following angles. Visual knowledge graphs, multimodal knowledge graphs, and graph modalities. Knowledge representation, knowledge graph building, and knowledge graph applications are now the three main areas of knowledge graph study.Knowledge Representation and Reasoning (KR, KRR) is an aspect of artificial intelligence (AI)[9] agent thinking that deals with how thinking influences the agent's intellectual abilities.

It is your obligation to communicate real-world knowledge so that computers may comprehend it and use it to solve challenging real-world issues like: B. Identify your illness or use normal language when interacting with others. It also serves as an example of how artificial intelligence may convey knowledge. Knowledge representation allows intelligent robots to learn from their knowledge and experience so that they may behave intelligently like people in addition to storing data in databases.

KG is a knowledge organisation and representation system based on graphs. - a number of topics -Predicates-Objects How to use triplets in expression various domain entities and their connections. Every triplet is also known as a fact. In KG, entities are represented by nodes, and interactions between entities are represented by edges. Think about "Parkinson's disease." The concrete entities[10] of the "Disease" and "Symptom" types are "Disease" and "Tremor." the medical field. "Parkinson's disease" disease related symptom "Shivering" indicates "shivering," as "disease related symptom" is the association between the unit of sickness and symptom. The "Parkinson's disease".

The majority of the effort done thus far has attempted to construct a KG using medical materials. Others are constructed automatically, while others are constructed manually. However, it takes a lot of time and effort for healthcare specialists to manually design the KG. For instance, around 15 The Internist-1,QMR Knowledge Base [The 8th] takes man-years to create. It's a difficult process to automatically create [11]KG from articles. On a computer, the information is poorly organised and challenging to comprehend.Since they may be used to combine and display data from multiple sources, including market quotations, company financial reports, news, and social network data, among others, knowledge graphs have an intriguing application in finance knowledge management.

Application of the knowledge graph

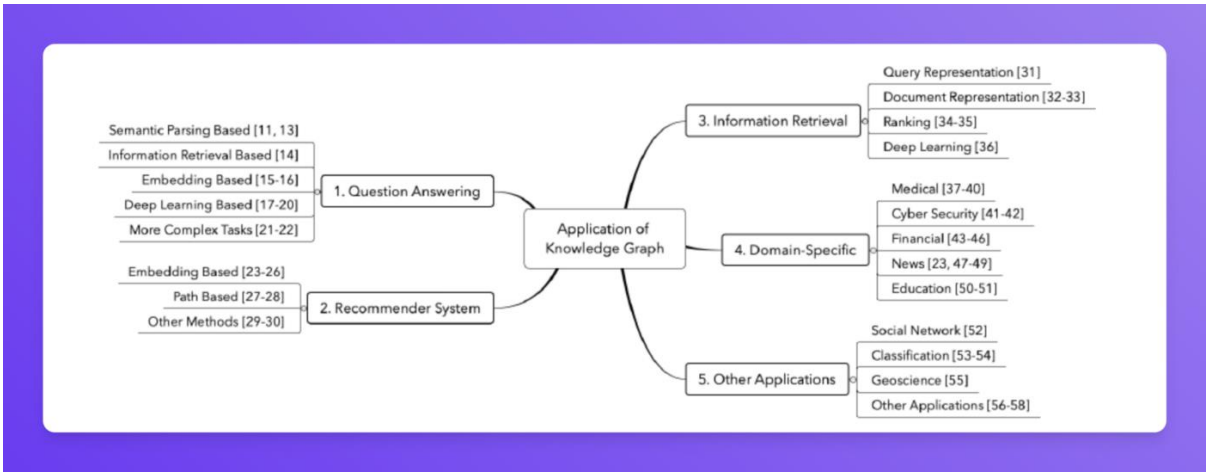


Fig 3.6 application of knowledge graph

Question answering system A semantically aware question answering service's search results can be enhanced by using the semantic data from KG[12]. IBM created Watson, a question-answering system that draws information from a variety of knowledge sets, to outperform human experts in quiz shows. Chabot and virtual assistants like Cortana and Siri also heavily rely on structured knowledge.

Recommender system A sort of recommendation system called collaborative filtering bases its recommendations on past interactions and user sharing preferences. Cold start concerns and a lack of user data are typically problems with this technology, but KG overcomes these problems by utilising secondary data. helpful for In general, adding KG[13] to recommender systems enhances accuracy, expands the kinds of articles recommended, and makes suggestions easier to understand.

Information retrieval Entity data from KG is now being used by an increasing number of for-profit web-based search engines to enhance search results. Google, for instance, employs graph search, but Facebook leverages data from Google Plus and Google Knowledge Graph. Search engines benefit from human understanding about the [14]KG real-world entity by being better able to comprehend inquiries and documents. The creation of big KGs improves these entity-oriented searches. KG may be utilised with a number of different parts. B. Query presentation, document presentation, and search engine ranking..

Domain-specific application

Medical: In healthcare information systems, familiarity with medical literature is becoming increasingly crucial. In order to access precise information through reasoning, attempts have been undertaken to include textual medical knowledge into the knowledge graph.

.

Cyber Security: By seeing and foreseeing dynamic threats and disseminating contextual information, KG may be used in conjunction with cyber security to assist safeguard users' digital assets. Treasury: By crawling each company's news, locating the designated entity, and pulling the commercial connections between connected stocks, you may create a corporate KG. Then, you may use this information to forecast stock price changes by combining it with the news sentiment of connected stocks.

News: The news language is extremely compressed and loaded with common sense and knowledge units. KG is undoubtedly helpful in this situation. Additionally, KG's link prediction duty may be modified to include bogus news identification. Education: Some studies make use of KG to suggest learning resources and depict ideas.

For instance, KnowEDU is a system that generates KG automatically for use in education. Instructional computer graphics (CG) nodes, as opposed to ordinary CG, which represents real-world entities, reflect educational principles that students must grasp. Social Networks: In order to identify and quantify privacy leaks, KG has been used to anonymize social networks.

Classification: When it comes to, say, image classification, you can utilise the knowledge graph to investigate the connections between categories in an image and use the semantic data that was extracted from the network to direct image classification tasks. Additionally, it is possible to alter neural network cells to incorporate outside information that directly aids prediction. Earth Sciences: While the majority of earth scientific research focuses on the processing of georeferenced quantitative data, some academics are attempting to glean knowledge and insights from textual earth science data. Editing geological records is the focus of this endeavour.

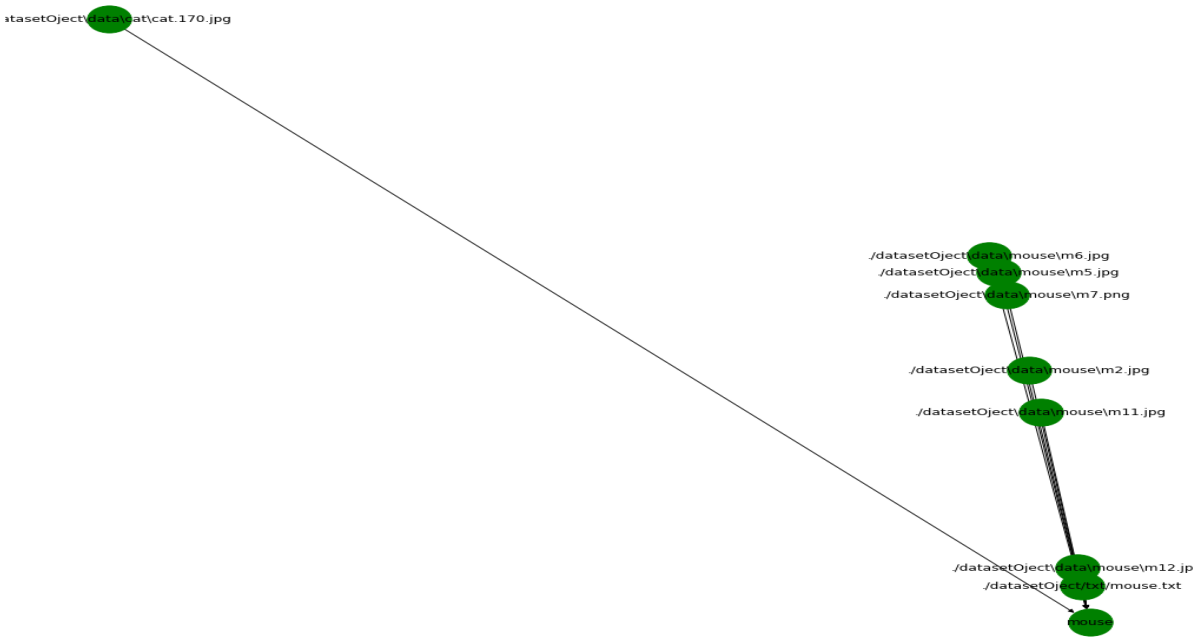
Applications

Applications for knowledge graph complement approaches often include:

1) Complementation of knowledge graphs is crucial to knowledge graph creation. Usually, top-down or bottom-up building techniques are used to create knowledge graphs[14]. When creating something from top to bottom, the builder first decides on the pattern structure and the ontology, or mental form. Using enormous volumes of internet data to extract related entities for bottom-up analysis.

2) It is a significant method of learning new information. Many high-level activities of the knowledge graph, such as assistance for question-answering systems, require knowledge graph complementation approaches.

Fig 3.7 shows the building the knowledge graph:



3.2.1 Evaluating models

OBJECT DETECTION

A computer vision method called object recognition may be used to locate and recognise certain things in an image or video. Specifically, object detection creates a bounding box around the things it finds, letting you know where (or how) they are in a given scene. Before continuing, it's crucial to establish the differences between object recognition and picture recognition as they are sometimes misconstrued. An picture is given a label through image recognition."Dog" is the caption for the dog photograph. The two dogs in the images are still referred to as "dogs." On the other hand, object recognition surrounds each dog with a box

that is labelled "dog." The model makes predictions about where each object will be found and what label will be appropriate. Consequently, object detection offers more details about the image than detection does.

Here, things are found using the You Only Look Once, version 3 (YOLOv3) paradigm.

It is a real-time object identification system that can recognise particular items in video, live feeds, and images.[15] Deep convolutional neural networks' learnt characteristics are used by YOLO to identify objects. Joseph Redmon and Ali Farhadi are credited with creating YOLO versions 1-3. Version 1 of YOLO was developed in 2016, and version 3, which will be covered in-depth in this post, was developed in 2016. An enhanced version of YOLO and YOLOv2, YOLOv3 is available. Utilizing Keras or the OpenCV deep learning package, YOLO is put into practise.

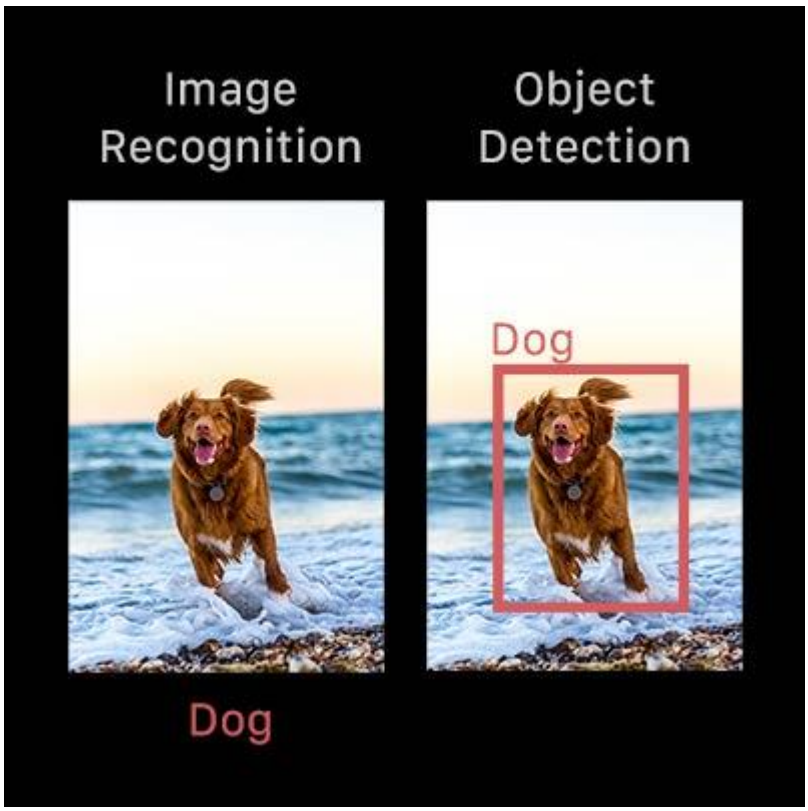


Fig 3.8 object detection

Types of Object detection

Deep learning-based techniques and machine learning-based approaches may both be used to recognise objects.

The conventional [16]ML-based technique examines many aspects of a picture using computer vision technologies. B. Using colour histograms or edges to locate clusters of pixels

that could represent an item. The position of the item and its label are then predicted using these characteristics using a regression model.

The deep learning-based method, on the other hand, employs a convolutional neural network (CNN) to carry out end-to-end unsupervised object identification without the need for separate feature definition and extraction. For a brief overview of CNN, look at this summary. As the most recent method for object recognition, deep learning techniques will be the main emphasis of this article.

Why is object recognition important?

Since object identification aids in the comprehension and analysis of image and video situations, it cannot be separated from other related computer vision methods like image recognition and image segmentation. But there is a significant distinction. While image segmentation provides a pixel-level insight of the scene's components, image recognition just gives the class labels of the items that were recognised. The capacity to locate things in pictures or movies is what sets object detection apart from these other tasks. This enables you to keep track of and count these items.

TEXT MINING

Large-scale unstructured text data analysis is called text mining, and it involves using software to find concepts, patterns, subjects, keywords, and other characteristics in the data. Although some people distinguish between the two names, it is also known as text analytics. In such case, text analytics refers to the programme that employs text mining methods to filter through data sets.

The emergence of big data platforms and deep learning algorithms that can analyse substantial amounts of unstructured data has made text mining increasingly useful for data scientists and other users. Incorporated papers,[18] customer emails, contact centre logs, verbatim survey responses, social network posts, medical records, and other text-based data sources may all be mined and analysed to uncover potentially useful business insights. As part of their marketing, sales, and customer support operations, businesses are increasingly using AI chatbots and virtual agents that combine text mining skills to provide consumers automatic replies.

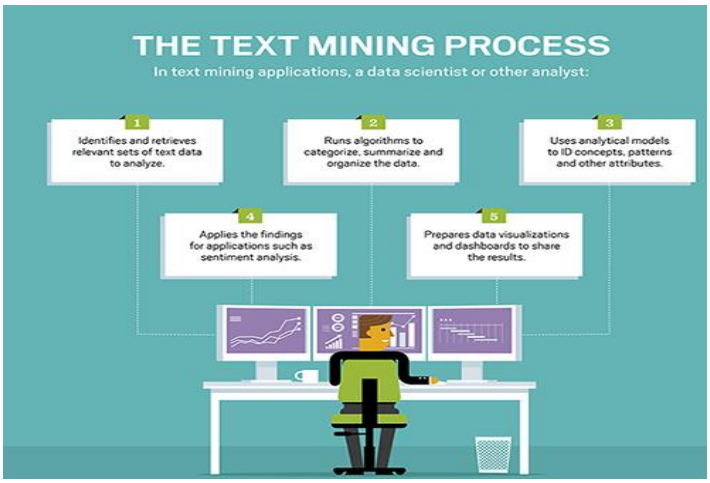
How text mining works: Similar to data mining, text mining concentrates on text rather than more organised data. To arrange and organise the data in some way so that it may be submitted to both qualitative and quantitative analysis, however, is one of the first phases in the text mining process. Natural language processing (NLP)[14] technology is frequently

used for this, which analyses and interprets datasets using computational linguistic principles. Text categorization, grouping, and labelling are all components of preparation work. record fusion. constructing a taxonomy; gathering data on word frequency, connections between data components, and other things. Run the analytical model after that to produce insights that will inform your corporate strategy and day-to-day operations.

Applications of text mining Sentiment

Text mining software called Analysis is frequently used to track consumer opinions of businesses. Sentiment analysis, sometimes referred to as opinion mining, extracts text from emails, contact centre interactions, social networks, online reviews, and other data sources in order to find patterns that indicate whether consumers are feeling positively or negatively. This data may be used, among other things, to develop new marketing strategies, enhance customer service, and repair product flaws.

Other frequent applications of text mining include selecting job candidates based on the language used in their resumes, filtering spam emails, categorising website content, flagging insurance claims that might be fraudulent,[18] examining corporate documents as part of electronic discovery procedures, and analysing descriptions of medical symptoms to aid in diagnoses. Information retrieval features similar to those offered by search engines and enterprise search platforms are also provided by text mining software, however they are often just a component of higher level text mining applications rather than a standalone programme.The chatbot provides basic customer support functions and responds to enquiries about products. Natural Language Understanding (NLU)[19] technology is used by them to do this. This branch of NLP enables bots to comprehend spoken and written language from humans and reply accordingly. Another similar technique is Natural Language Generation (NLG), which analyses text-generating sources such as documents, photographs, and other data.



CHAPTER 4
RESULT AND DISCUSSION

In this project, we are Building the knowledge graph of the images and text from the image and textual datasets using the YOLO-V3 [20](object detection model)and using the spacy algorithm of the natural language processing .

The knowledge graph has the following:

Images has connection to the multiple classes.

Nodes is classes and corresponding images associate with it.

Objects are detecting with the model(yolo-v3).

The knowledge graph with text and images shown below:

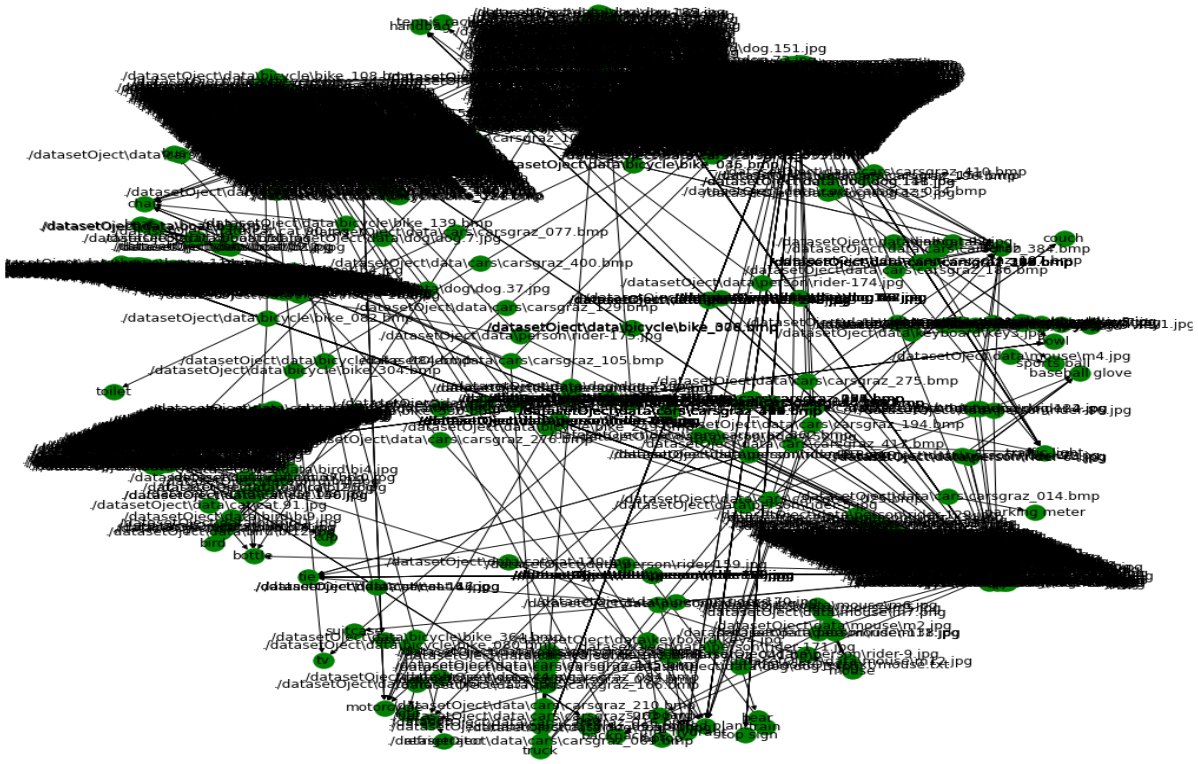


Fig 4.1 shows the knowledge graph of both text and image

The objects are detected from the external search query and then search module will search the queries on the knowledge graph and then ranking performed and giving the results of images and textual information on basis of the objects on the image.

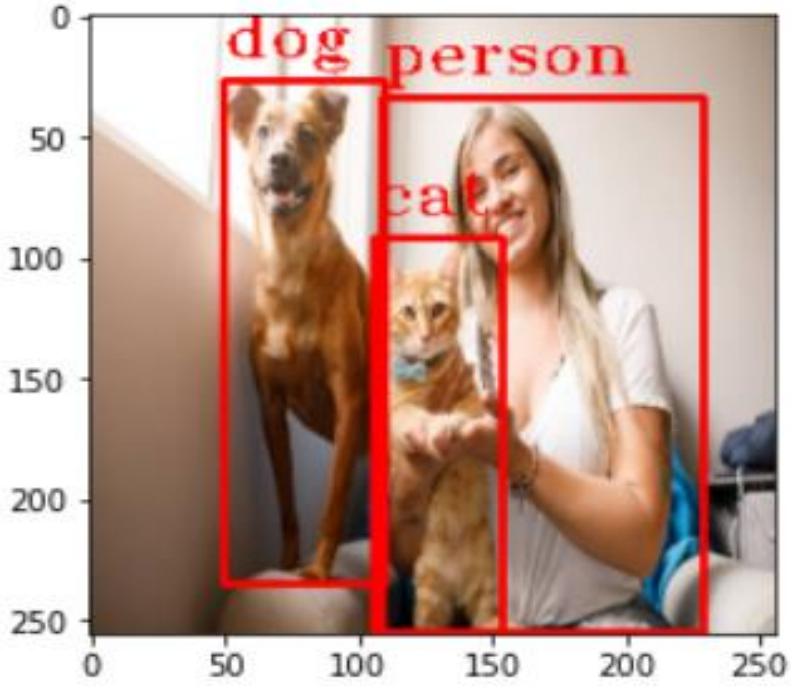
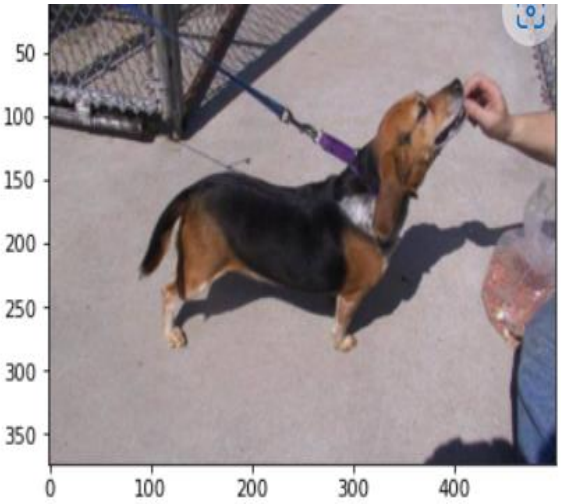


Fig 4.2 detection of object on image

person beings are anatomically similar and related to the great apes but are distinguished by a more highly developed brain a nd a resultant capacity for articulate speech and abstract reasoning. In addition, human beings display a marked erectness of body carriage that frees the hands for use as manipulative members.

A dog is a mammal in the order Carnivora.The history of dogs is an old tale indeed. You could say as long as there has been c ivilisation, there have been records of humans and dogs.

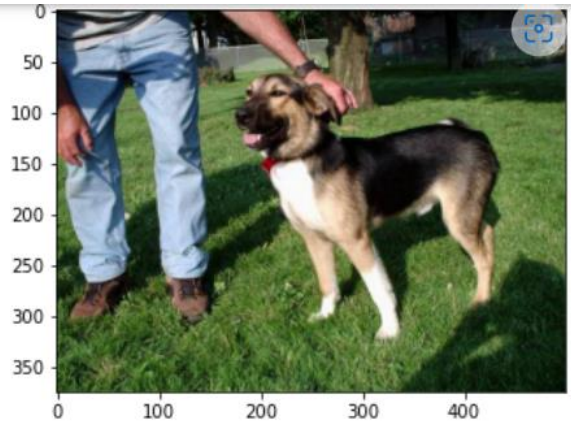
Cat are believed to be the only mammals who don't taste sweetness. cat are nearsighted, but their peripheral vision and night vision are much better than that of humans.


50
100
150
200
250
300
350
0
100
200
300
400


0
25


0
25
50
75
100
125
150
175
0
50
100
150
200
250


0
50
100


0
50
100
150
200
250
300
350
0
100
200
300
400

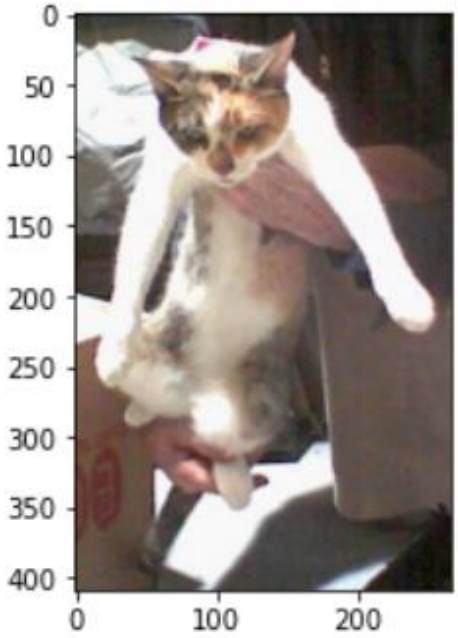


fig 4.3 output of object on images

Accuracy of the system can be measured by :

In machine learning, the data for testing has ground truth or actual prediction

But in information retrieval systems, no ground truth so, we have to compute manually

So we take following measures to compute:

Precision: how many retrieved items are relevant.

precision=correct relevant retrieved doc/total retrieved doc

Here,593/602=0.98

Recall: how many relevant items are retrieved.

Recall=relevant retrieved doc/ total possible relevant doc

Here,593/3285=0.18

Fall-out: the percentage of non-relevant documents out of all the non-relevant documents available that are retrieved.

Here,9/602=0.014

CHAPTER 5

CONCLUSION AND FUTURE WORK

Object detection may be a great influence with this project. A fresh framework for knowledge recognition. Compared to a current algorithm that concentrates primarily on visual characteristics, these advocate utilising extraneous knowledge, such the knowledge graph. Therefore, we derive and measure the knowledge graph's knowledge coherence. The information graph can be applied to an additional picture with an unknown context. Then incorporate your knowledge into the object detection techniques you already have. By improving intellect to get greater results semantic harmony. Finally, it exhibits superb performance. Of the strategy suggested by means of comprehensive testing a pair of benchmark datasets. Graphs of knowledge[21], which portray data as semantic networks, which spark several worries in both industry and academia. With the potential to create smarter machines, the ability to give semantically organised information offers significant answers for a variety of activities, including providing advice, providing recommendations, and gathering information. Numerous researchers think it proves. The Google search engine introduced the knowledge graph. Traditional web search techniques are no longer adequate to meet learners' needs for quick access to the information resources they require in today's continuously evolving world. Knowledge graph technology has emerged in this context. Learners must also get over barriers to disciplinary action, integrate, and innovate due to the complexity, diversity, and originality of the knowledge they are acquiring. Integrated\scourse The development of different intelligences is necessary for STEAM learning, and the learner's way of thinking must unquestionably be lateral. switching from an ad hoc approach to systematic thinking, vertical reasoning. In contrast to employing common information in future work, we intend to investigate or develop a knowledge graph that has been specifically optimised for visual tasks. Diagrams should not focus on visual relationships

REFERENCES

[1] J.Li and L.Hou, "Review of Knowledge Graph Studies," J. Shanxi University, natural Science. Hen, vol. 40. no. 3. p. 454–459, March 2017.

[2] M Nickel, K Murphy, V Tresp, E Gabrilovich, " Relational Machine Learning for the Knowledge Graph ", Proceedings of the IEEE, vol. 104, no. 1, pp. 11–33, 2016.

[3] Techniques for Image Retrieval: A Survey Here, K. Shubhankar Reddy and K. Sreedhar

[4] J.DingundW。 Jia, "Progress in Research on Knowledge Graph Completion Algorithms", Inf.Commun. Technol. , No. 1, pp. 56-62, April. 2018.

[5] G. Qi, H. Gao, and T. Wu, "Progress in Knowledge Graph Research", Technology Intelligence Eng. , Vol. 3, no. 1, p. April 25, 2017.

[6] Lin Y, Han X, Xie R, Liu Z, and M. Sun, "Expression of knowledge Learning: Quantitative Review ", arXiv-Preprint arXiv: 1812.10901, 2018

[7] M. Zhu, B. Bao, C. Xu, "Progress in development and research on development

Construction of the knowledge graph ", J. Nanjing University Information Science. Technology.

[8] H. Paulheim, "Improvement of Knowledge Graph: Review of Approach" And evaluation method ", Semantic Web, vol. 8, No. 3, pp. 489–508, 2017

[9] H. Xiao, M. Huang, and X. Zhu, "Point to Manifold: Embedding Knowledge Graph for Accurate Link Prediction," Proc. 25th Int. together conf. artif. Intelligence IJCAI, July. 2016.

[10] T. Wu, G. Qi, C. Li, M. Wang, "Technology Overview To create a knowledge graph of China and its applications ", Sustainability, vol. 10, no. 9, p. 3245, 2018.

[11] X. Chen, p. Jia and Y. Xiang, "A Review: Knowledge Reasoning. About the knowledge graph ", an expert system with applications, vol. 141, p. 112948, 2020.

[12] R. Xie, Z. Liu, M. Sun, "Typical learning of knowledge Hierarchical Graph ", Proc. 25th Int. Common meeting Artif. Intelligence IJCAI, July. 2016、S。2965–2971。

[13] D. Q. Nguyen、K. Sirts, L. Qu, and M. Johnson, "Neighborhood Mixture" Proc. 20 "Knowledge Base Complete Models". SIGNLL-Conf. Computation. Natural long. Learn. , 2016, pp.40-50.

[14] T. Jiang, T. Liu, T. Ge, L. Sha, S. Li, B. Changund Z. Sui, "coding Time recognition Time information for connection prediction, "" Proc. Conf. Empirical method Natural Lang. Process, 2016, pp. 2350-2354.

[15] Lin Y, Liu Z, Sun M, "Learning by Knowledge Representation" Entity, Attribute, and Relationship, Proc. 25. Int. Common meeting Artif. Intelligence IJCAI, July. 2016, pages 101-1 2866 ~ 2872.

[16] B. Shi und T. Weninger, "Open-World Knowledge Graph Completion", 2017, arXiv: 1711.03438. [online]. Available: http: //arxiv.org/abs/ 1711.03438

[17] About R. Reiter, closed world databases (logic and databases). Boston, Massachusetts, USA: Springer, January 1977, pp. 55-76.

[18] Z. Du, X. Meng, and S. Wang, "Major Research Advances Knowledge Graph Completion Technology, Scientia Sinica Informationis, Volume 50, no. 4. S. 551–575, April 2020.

[19] J. Liang, S. Zhang and Y. Xiao, "How to Synchronize the Knowledge Base with Encyclopedia Sources," Proc. The 26th International Conference Artif. Intel。、8。2017、pp.3749-3755。

[20] H. Shah、J. Villmow, A. Ulges, U. Schwanecke und F. Shafait, "Openworld Extension to Knowledge Graph Complementary Model", 2019, arXiv: 1906.08382. [online]. Available: http: //arxiv.org/abs/1906.08382

[21] Q. Chen, K. Chen, S. Wu, L. Shou, and G. Chen, "Study on Completion of Knowledge Graph Based on Active Learning," J. Frontiers Comput. Chemistry. Technol. , Vol. 14, No. 5 、S. 769–782、2020.

[22] A. Hogan、E. Blomqvist、M. Scheck, C. d`Amato, G. de Melo, C. Gutierrez, J.E. Gayo L、Kirrane S、Neumaier S、PolleresA。 R Navigli 、 BC N. Ngomo 、 SM Rashid 、 A.S。 Rula、L。Melting Iron、 J. Sequeda、S Staab、A。Carpenter 2020

[23]S. Guan, X. Jin, Y. Jia, Y. Wang, and X. Chen, "Knowledge Reasoning on the Knowledge Graph: Survey", J. Softw. , Vol. 29, Nr. Ten, S. 2966–2994, 2018.

[24]Object detection meets knowledge graphs by Yuan Fang, Kingsley Kuan, Jie Lin, Cheston Tan, and Vijay Chandrasekhar Institute for Infocomm Research.

[25]Research on Information Retrieval System Based on Semantic Web and Multi-Agent, Junwei Luo; Xiao Xue

[26]Information retrieval and processing system for news articles in English, Gnana Venkata Naga Sai Kalyan Karumudi