ISSN No:-2456-2165

User Recommendation System on Text Based Images

Abishek Karthik; Adarsh V.
RV College of Engineering, Karnataka, India

Abstract:- With the growth of social media, online shopping, and e-commerce, images have become an integral part of our daily lives. The keyword search system for text-based images is an important project in today's world because of the vast amount of digital images that are generated and shared every day. However, finding a specific image from this vast collection can be a daunting task, especially when we have to search through thousands or even millions of images. So, Our System will help users to easily fetch the images based on the Keyword Search. A GNN is used for user recommendation.

Keywords:- *Keyword Search, Text-based images.*

I. INTRODUCTION

With the growth of social media, online shopping, and e-commerce, images have become an integral part of our daily lives. The keyword search system for text-based images is an important project in today's world because of the vast amount of digital images that are generated and shared every day. However, finding a specific image from this vast collection can be a daunting task, especially when we have to search through thousands or even millions of images.So, our system will help users to easily fetch the images based on the Keyword Search. A recommendation is also made to the user based on the previous searches they have made.

II. LITERATURE SURVEY

A. "Content-based Image Retrieval using Tesseract OCR Engine and Levenshtein Algorithm"

Authors: Charles Adjetey Kofi Sarpong Adu-Manu (2021): This paper provides a technique for obtaining a full image document given that the user has some portions of the document under search. A combination of Optical Character Recognition (OCR) engine and an improved text matching algorithm was used in the system implementation. The Tesseract OCR engine and Levenshtein Algorithm were integrated to perform the image search.

B. "A New Content-Based Image Retrieval Method on the Google Cloud Vision API"

Authors: Shih-Hsin Chena Yi-Hui Chen (2017): This paper investigates the effectiveness of Google Cloud Vision API compared with some efficient Machine learning algorithms in the literature.

C. "Smart Gallery using Google Vision"

Authors: Shalva Thakurdesai Shubham Vira Gouri Kanitkar Dr. Jagruti Save (2021): This paper comprises a system which helps intelligent gallery management. For this, a server, mobile interface and web interface has been made. The mobile interface uploads photos to the server and ensures privacy of photos. The server processes the photos and saves the data like size, object analysis and OCR in the database.

D. "Knowledge Graph-Based Image Classification"

Authors: DEHAI ZHANG MENGLONG CUI YUN: This paper talks about the biologically inspired ideas that are important in image processing. The usage of human brain reasoning mechanism to present the image knowledge graph(IKG) as a biological vision mechanism to improve the performance of the image classification.

E. "Semantic-Based Search Engine System for Graph Images in Academic Literatures by Use of Semantic Relationships"

Authors: Sarunya Kanjanawattana and Masaomi Kimura: This paper talks about information retrieval which is a baseline of search engine systems. There is a very large amount of data published on the Internet that cannot be manually searched. However, search engine systems should not only present relevant results but also obtain new knowledge from the user's searches. The main idea of this research was to propose methods for extracting information from graphical and linguistic representations as well as utilise them to express explicit and implicit knowledge.

F. A User-Centred Approach for Information Retrieval"

Authors: Antonio Picariello Antonio M. Rinaldi: This paper talks about Information retrievals which can take great advantages and improvements considering users' feedback. Therefore, the user dimension is a relevant component that must be taken into account while planning and implementing real information retrieval systems. In particular, combining the Semantic information from a general knowledge base with statistical information using relevance feedback. Several experiments and results are presented using a test set constituted of Web pages.

G. "An Empirical Study of Important Keyword Extraction Techniques from Documents"

Authors: H. M. Mahedi Hasan, Falguni Sanyal, Dipankar Chaki: This paper explores keyword extraction that compiles a list of phrases that give a general overview of the material.Keyword gives information regarding identifying a specific document. Keyword extraction will be the main strategy, to analyse a large number of documents and extract the pertinent information. This strategy will enable us to comprehend its depth even before we read it. Two or more strategies used- statistical, machine-learning, semantic data.

H. "Explainable Graph-based Search for Lessons-Learned Documents in the Semiconductor Industry"

Authors: Hasan Abu-Rasheed , Christian Weber, Johannes Zenkert , Roland Krumm, Madjid Fathi (July 2021):This paper focuses on knowledge graphs.Industrial processes produce a considerable volume of data and thus

information. Whether it is structured sensory data or semi- to unstructured textual data, the knowledge that can be derived from it is critical to the sustainable development of the industrial process. A search engine is developed and applied to answer queries.In contrast to mere keyword-based searching, the searchability of the knowledge graph offers enhanced search results beyond direct matches and acts as a mean for generating explainable results and result recommendations

I. "Deep Learning on Knowledge Graph for Recommender System: A Survey"

Authors: YANG GAO and YI-FAN LI: This paper talks about recommender systems (RS) which are used to help users make decisions about products or services. Traditional RS are content-based or collaborative-filtering based, but they are not effective for all applications. Knowledge graphs (KGs) can encode high-order relations between objects, and graph neural networks (GNNs) can be used to extract information from KGs. GNNs have been shown to be effective for a variety of RS tasks, such as item recommendation, user profiling, and cold-start recommendation.

J. "Graph neural networks: A review of methods and applications"

Authors: Zhou Ganqu Cui Shengding Hu Zhengyan Zhang: This paper uses Graph neural networks (GNNs) which are neural models that capture the dependence of graphs via message passing between the nodes of graphs. In recent years, variants of GNNs such as graph convolutional network (GCN), graph attention network (GAT), graph recurrent networks (GRN) have demonstrated ground-breaking performances on many deep learning tasks. In this survey, we propose a general design pipeline for GNN models and discuss the variants of each component, systematically categorise the applications, and propose four open problems for future research

K. "The Graph Neural Network Model"

Authors: Franco Scarselli, Marco Gori, Ah Chung Tsoi, Markus Hagenbuchner, Gabriele Monfardini: This paper talks about the many underlying relationships among data in several areas of science and engineering, e.g., computer vision, molecular chemistry, molecular biology, pattern recognition, and data mining, which can be represented in terms of graphs. In this paper, we propose a new neural network model, called graph neural network (GNN) model, that extends existing neural network methods for processing the data represented in graph domains. This GNN model, which can directly process most of the practically useful types of graphs, e.g., acyclic, cyclic, directed, and undirected, implements a function tau(G,n) is in IR m that maps a graph G and one of its nodes *n* into an *m* -dimensional Euclidean space.

L. "A Comprehensive Survey on Graph Neural Networks"

Authors: Zonghan Wu; Shirui Pan; Fengwen Chen; Guodong Long; Chengqi Zhang; Philip S. Yu: This paper explores the concept of deep learning has revolutionised many machine learning tasks in recent years, ranging from image classification and video processing to speech recognition and natural language understanding. The data in these tasks are typically represented in the Euclidean space. However, there is also an increasing number of applications in GNN especially in data mining.

III. OBJECTIVE OF STUDY

- The main purpose of the keyword search system for text-based images is to allow users to search for images based on the presence of specific keywords or phrases within the text that appears in the image.
- By using the proposed keyword search system, users can easily locate images that contain specific text that is relevant to their needs, such as product names, descriptive text or keywords associated with a particular theme or topic. This can help to streamline the image search process and make it easier to find the right image quickly and efficiently.
- To implement a GNN to map images to which users would be interested in them.
- To calculate the F1 score and checking if the model's score is above 0.8

IV. METHODOLOGY

- **Data Collection:** Collect data on real time images and store them in a database or a file system.
- **Data Preprocessing:** Resize the images, convert them to a format that the GNN can understand, and remove any noise from the images. Implement using a variety of technologies, such as Python libraries or machine learning frameworks.
- **Inference:** Select the relevant features from the data that are most likely to impact the recommendation system. The inference layer can be implemented using a variety of technologies, such as Python libraries or machine learning frameworks.
- **Model Selection:** Choose an appropriate neural network model for user recommendation based on the selected features. This can include GNN algorithms.
- **Model Training:** Train the machine learning model using real-time data using TensorFlow or PyTorch.
- **Model Evaluation:** Evaluate the performance of the model using metrics such as precision, recall and F1 score.
- **Deployment:** Deploy the trained model into a web application or mobile app, where users can input their details and receive a recommendation.
- **Continuous Learning:** Continuously update the model with new data to improve its accuracy over time.

ISSN No:-2456-2165

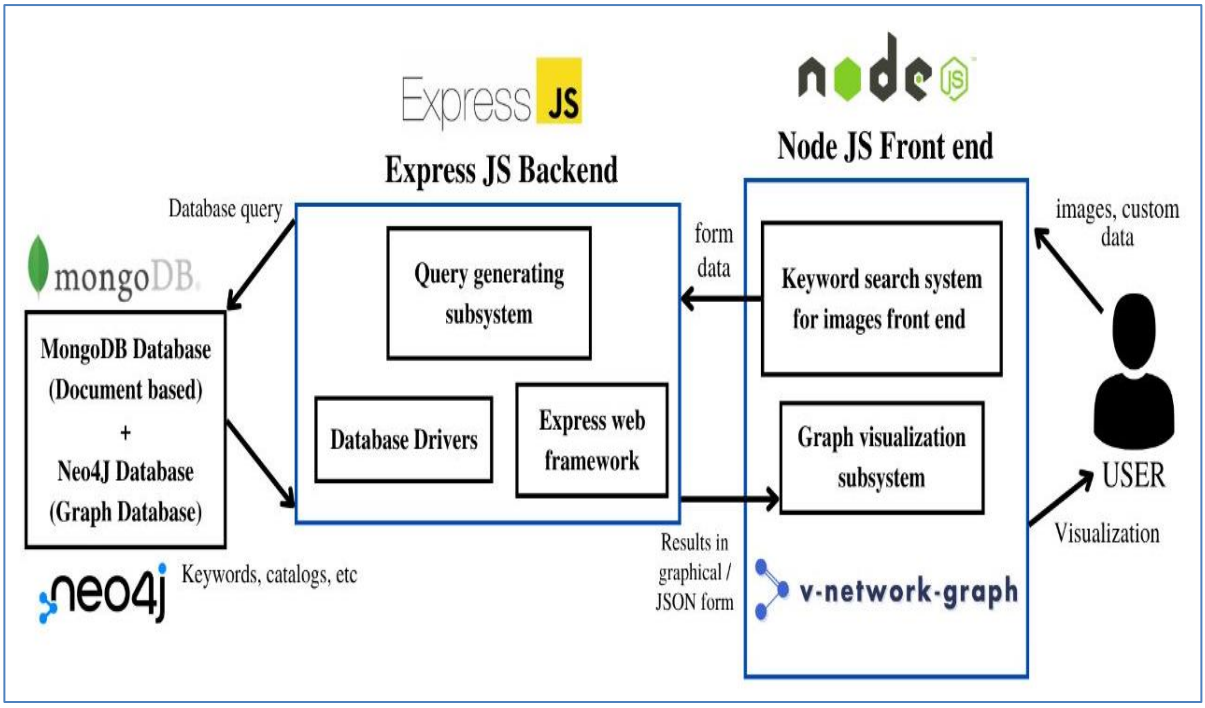

Fig. 1: Methodology

V. IMPLEMENTATION

The user enters the values of the different parameters necessary for inputting of data and required Keyword Search.

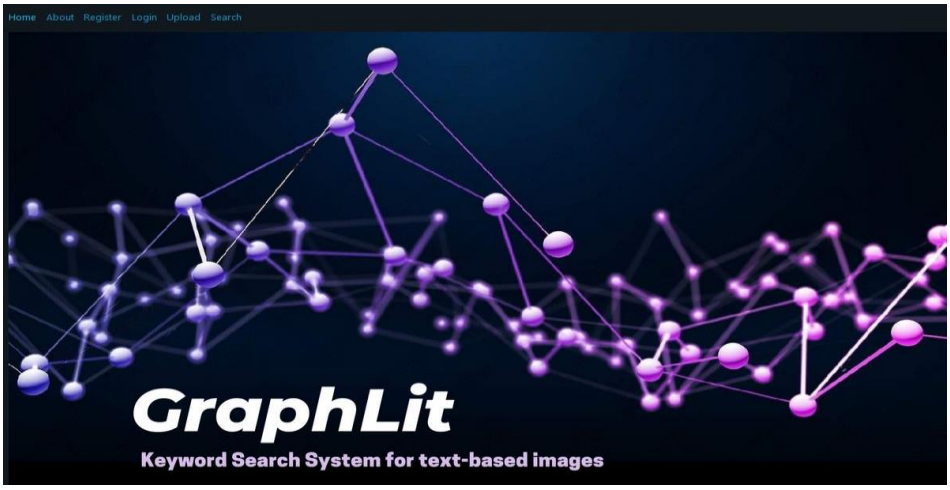

Fig. 2: Home Page

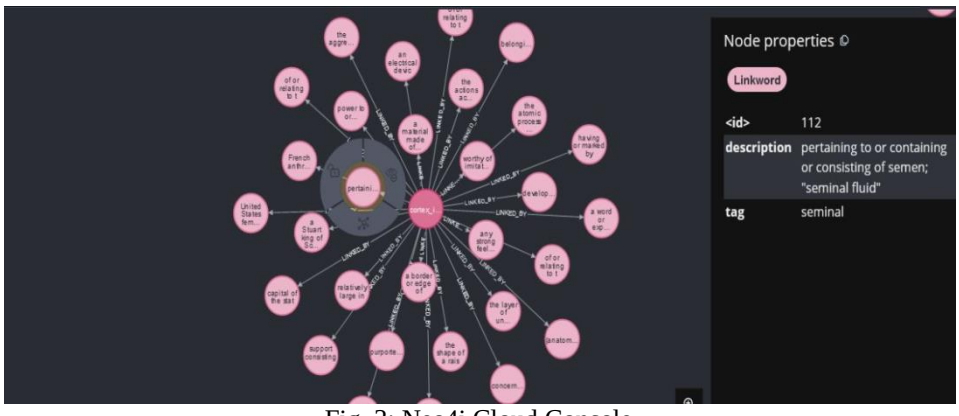

Fig. 3: Neo4j Cloud Console

ISSN No:-2456-2165

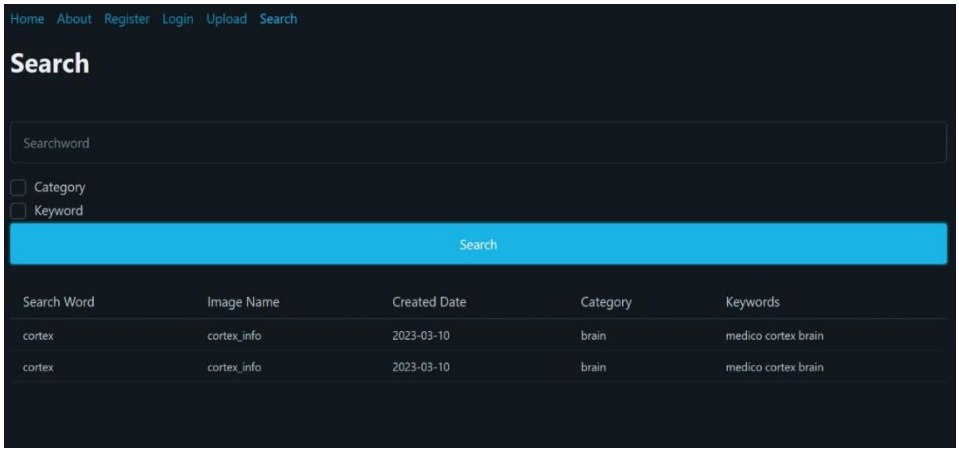

Fig. 4. Search Page

- Linkword nodes enable users to establish connections between nodes that might not otherwise be connected, allowing for the creation of complex networks of relationships in a graph database.
- Linkword nodes can represent any concept or entity that has a relationship with other nodes in the database, including chemical elements, scientific concepts, or any other type of data.
- By using Linkword nodes to connect nodes that might not otherwise be connected, users can perform more comprehensive analysis of the relationships between different entities in their graph database.
- Linkword nodes can be created with various properties, such as a unique ID or a type label, which can help to streamline querying and data analysis.
- The use of Linkword nodes in a graph database can help to reveal previously unseen relationships between different entities, providing valuable insights for scientific research or other types of data analysis

VI. ANALYSIS

After experimenting with different GNN algorithms and evaluating their performance on relevant metrics, such as recommendation accuracy and user satisfaction, the most suitable algorithm is used.

VII. RESULTS AND CONCLUSION

A. *Results:*

The recommendation system provides accurate and relevant recommendations to users. When the user performs a search using keywords related to text-based images, the system analyses the keywords, compares them with the indexed data, and generates recommendations that align with the user's interests. The quality of the recommendations evaluated shows an F1 score of 0.9.The recommendation system enhances user engagement by suggesting images that match the user's interests. The user recommendation system based on keyword search offers personalised recommendations tailored to individual user preferences. By analysing the keywords and understanding user behaviour, the system learns and adapts to each user's interests, providing a personalised experience. Additionally, the system also helps users discover new and relevant images or content they might not have encountered otherwise. The recommendation system incorporates feedback and continuously learns from user interactions. By collecting user feedback on the recommendations and iteratively refining the algorithms and models, the system improves over time and provides increasingly accurate and relevant recommendations.

B. *Conclusions:*

In conclusion, the system for text-based images can enhance user engagement and satisfaction by providing accurate and relevant recommendations based on keyword search verified by 0.9 F1 score. By analysing the content of images, extracting keywords, and leveraging Graph Neural Networks (GNNs) and other algorithms, the system generates personalised recommendations and helps users discover new content. The system's ability to deliver accurate recommendations, increase user engagement, and continuously improve through user feedback contributes to a positive user experience. Regular monitoring and iteration are crucial to ensure the system remains aligned with user preferences and expectations, providing ongoing value to both users and the platform

VIII. FUTURE ENHANCEMENTS

- The keyword search system for text-based images utilises Tesseract OCR technology to extract text from images and create a knowledge graph based on extracted keywords.
- While the system has shown promising results, there is room for improvement in terms of accuracy, supporting multiple languages, enhancing the user interface, and supporting more image formats.
- Improving accuracy is a crucial area for future work, which could be done by exploring new OCR technologies or developing better image pre processing techniques.
- Supporting multiple languages is essential for making the system more globally accessible, and enhancing the user interface can improve the user experience.
- Supporting more image formats can make the system more versatile, and continued efforts to improve the system can make it an invaluable tool for various industries.

ISSN No:-2456-2165

ACKNOWLEDGMENT

At the conclusion of this thrilling journey, We would like to sincerely thank a few important persons who made it possible. We would first like to express our gratitude to Dr. K N Subramanya, the principal of RV College of Engineering, for giving us the encouragement and opportunities to further our studies and follow our passion for computer science. Your unshakable confidence in our skills has been a constant source of encouragement.

We also want to express my gratitude to Dr. Ramakanth Kumar P, the head of the computer science department, who has provided us with advice and assistance throughout our academic career. Our development into the person We are now would not have been possible without your unfailing encouragement and support.

Our deepest gratitude also extends to Prof. Shanta R, our professor, for her crucial contributions to this effort. This event has been made absolutely remarkable by your professional expertise and knowledge as well as your enthusiasm for education.

Finally, We would like to provide a sincere thank you to all of the wonderful people who have contributed to the impact and memorability of this voyage. We count ourselves extremely fortunate to have had their support and direction, and We aim to continue doing them proud in all that We do in the future.

REFERENCES

[1]. K. Pustu-Iren, G. Bruns, and R. Ewerth, “A multimodal approach for semantic patent image retrieval,” 2021.
[2]. P. Ghadekar, S. Kaneri, A. Undre, and A. Jagtap, “Digital image retrieval based on selective conceptual based features for important documents,” in Evolutionary Computing and Mobile Sustainable Networks. Springer, 2021, pp. 569–579.
[3]. K. M. Lakshmi et al., “An efficient telugu word image retrieval system using deep cluster,” Turkish Journal of Computer and Mathematics Education (TURCOMAT), vol. 12, no. 11, pp. 3247–3255, 2021.
[4]. L. Yang, M. Gong, and V. K. Asari, “Diagram image retrieval and analysis: Challenges and opportunities,” in Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops, 2020, pp. 180–181.
[5]. W. Zhou, H. Li, and Q. Tian, “Recent advance in content-based image retrieval: A literature survey,” arXiv preprint arXiv:1706.06064, 2017.
[6]. A. Jain, “The role and importance of search engine and search engine optimization,” International Journal of emerging trends & technology in computer science, vol. 2, no. 3, pp. 99–102, 2013.
[7]. N. Hochst ¨ otter and D. Lewandowski, “What users see–structures in ¨ search engine results pages,” Information Sciences, vol. 179, no. 12, pp. 1796–1812, 2009.
[8]. A. V. Singh, “Content-based image retrieval using deep learning,” 2015.
[9]. B. Wang, X. Zhang, and N. Li, “Relevance feedback technique for content-based image retrieval using neural network learning,” in 2006 International Conference on Machine Learning and Cybernetics. IEEE, 2006, pp. 3692–3696.
[10]. A. Rashno and E. Rashno, “Content-based image retrieval system with most relevant features among wavelet and colour features,” arXiv preprint arXiv:1902.02059, 2019.
[11]. R. R. Saritha, V. Paul, and P. G. Kumar, “Content based image retrieval using deep learning process,” Cluster Computing, vol. 22, no. 2, pp. 4187–4200, 2019.
[12]. K. Zagoris, S. A. Chatzichristofis, N. Papamarkos, and Y. S. Boutalis, “img (anaktisi): A web content based image retrieval system,” in 2009 Second International Workshop on Similarity Search and Applications. IEEE, 2009, pp. 154–155.
[13]. K.-M. Wong, K.-W. Cheung, and L.-M. Po, “Mirror: an interactive content based image retrieval system,” in 2005 IEEE International Symposium on Circuits and Systems. IEEE, 2005, pp. 1541–1544.
[14]. F. Karamzadeh and M. A. Azgomi, “An automated system for search and retrieval of trademarks,” in Proceedings of the 11th International Conference on Electronic Commerce, 2009, pp. 374–377.
[15]. B. Girod, V. Chandrasekhar, R. Grzeszczuk, and Y. A. Reznik, “Mobile visual search: Architectures, technologies, and the emerging.