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Novel Approach for Automated Web Service Discovery from Public Repositories

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ABSTRACT

A web service is a network accessible interface to functionality of application, which is developed using some standard internet technologies. The client or users of web services don't need to know how the web service is implemented. The number of web services available on the internet and within businesses is growing, which poses new challenges for looking for and locating necessary web services in library. There are many different approaches available for discovery of web services in library. Few of them are based on syntax whereas further approaches are semantic based. Research work highlights of the earlier work on discovery of the published web services. Additionally it defines the approaches and the new techniques available for Web Service Discovery.Also, this research will promote awareness among developers about the publishing free web services in library.

KEYWORDS

Logic based search, Probabilistic matchmaking, Machine learning, Web service discovery.

Introduction

This paper has more and more web services available, it is imperative to have a trustworthy, reliable, and effective process for managing and retrieving web services so that search results are appropriate and accurate for the user's requested query. Web services in library are accessed through web, which are public, loosely connected program components. The steps of a WSD model are three. The initial stage consists of programmer-completed web service marketing. By registering newly produced services using a file that is written inside the public repository, known as a web service description file (WSDL), service providers advertise their services within publicly accessible repositories. The user will submit a web service request in the following phase. In the discovery paradigm, the user submits a request for a necessary web service, together with the needs, to the web service repository. The

requirements are predetermined and planned. The matching of web services—which involves matching user queries or demand to accessible or available web services—is the central component of the service discovery model. Web services are then extracted.

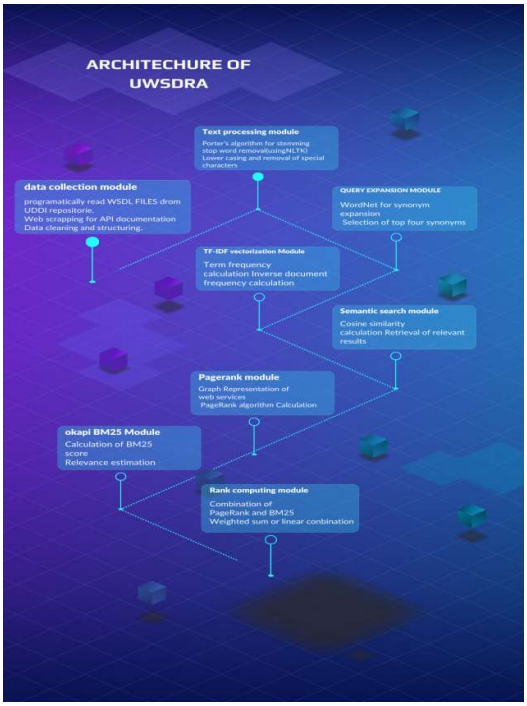


Figure 1 Architecture of UWSDRA for web service discovery

Choosing, calling, or calculating the necessary, retrieved, or accessed web services is the last step. Finding the necessary or appropriate online service primarily depends on how well the service matching procedure works [22]. This includes how the services are compared or matched with published or available services, as well as how the user's or requester's actual requirements or requests are to be conveyed in a specific way.
The XML-based software or application components are called Web Services. Regardless of the platform onwhich the service is built or created, other systems or apps will be able to access the Web services [22]. The Web Service Description Language, or WSDL, contains the web service information.

The web service is like an client server communication. The service providers are providing the services by using web services. The web service contributor builds web service and publishes them into UDDI registry. The user can get that web services from UDDI. The user can provide the input as format required by web service and invoke. The input provided by user given to the server and server site computation is done and then result shown to the user.
All that UDDI consists of is a set of specifications and descriptions that define a service registry for various electronic and non-electronic services as well as facts about Web services.
A service registry called UDDI manages data about Web services, including metadata, contributors, and operation. UDDI registry is used by providers to market or advertise their online services. After that, the end user uses UDDI to find the necessary Web services and obtain service details, metadata, and other data needed to make use of those published and necessary services. [23].

The service developers or service providers advertise their developed web services into UDDI registry means they use UDDI for advertising purpose. Users then use UDDI for getting required web services.
The XML-based interface description language, known as WSDL, is useful for specifying the services that published web services offer. Any specific Web Service Description Language description of a web

service, denoted by the abbreviation WSDL, specifies how the service can be called in a machine-readable manner, what kind of parameters are needed, and what kind of parameters or data type the service will return. To provide Web services via the Internet, XML Schema and SOAP are used to retrieve or use the Web Service Description Language. [24]. The user program accessing a Web service can understand the Web Service Description Language file for calculating which methods exist at the provider side or server. The WSDL is depend on XML so the web service discovery will done smoothly because XML is platform independent and web services are in WSDL file. The web services which can be implemented in any type of programming language are can be accessed because of XML based format. We can read or discover any web service which is developed in any language.

Literature survey

Filling With its unmatched quantity of resources, the Web has emerged as the go-to source for information for both teachers and students as they choose pertinent content for lessons and learning exercises. The retrieval along with assessment of educational materials is more complicated than it is for other products or services, despite the fact that search engines are among the top techniques for finding educational content due to the realities of the teaching and learning processes. The broadness of the Web and the absence of educational information on web sites necessitate the adoption of specific approaches for a more accurate ranking of educational content. We present a novel strategy based on translational technologies in this work. [1]

We conduct an assessment with university instructors, considering over 70 inquiries to gauge Semantic Search's performance in comparison to the ERP in addition to two cutting-edge approaches: Tf-Idf and BM25F. When compared to the three baselines, the improvements made by applying the Semantic Search approach are statistically supported by paired t-tests of four accuracy measures. [1]

As web tracking techniques gain popularity, numerous countries are enacting and enforcing new privacy laws to safeguard their citizens' rights. Nonetheless, navigating the dynamic online landscape and the prevalence of concealment tactics make it progressively challenging to identify websites that comply with these standards. [2]

This paper presents ePrivo, a novel online tool designed for evaluating website privacy practices. Following a half-year of operation, ePrivo identified the biggest trackers of browser history along with over forty thousand domains, including cookies that last more than a year—a duration that is prohibited in certain nations. [2]

The precise evaluation of various online services can pose challenges based on the criteria used; however, once completed, it facilitates better selection of web services in the future. This research proposes a method for assessing trust prediction and confusion matrix to rank online pages. The evaluation of trust scores (TS) for response time and throughput services involves testing AdaBoostM1 and J48 classifiers using a benchmark web services dataset. Trust scores are calculated using confusion matrices, as recommended, and trust prediction [3]. When using web services, accurate user prediction of is performed using 5-Fold, 10-Fold, and 15-Fold cross-validation techniques. [3]

Based on the data released, web service 1 (WS1) garnered the greatest trust among users, registering a TS value of 48.5294%, while web service 2 (WS2) received the least trust, with a TS value of 24.0196%.trusted and untrusted users has increased the general selection procedure among a group of related online services. Values from kappa statistics are used to compare the two classifiers indicated above and to assess the suggested methodology. [3]

Service Oriented Architecture (SOA) has modern web applications, particularly through the evolution of Web Service technology architectures. However self-contained services has raised challenges in efficiently discover the relevant services growing the option. This paper presents a Systematic Literature Review study aimed at comprehensively reviewing existing

approaches to service discovery in microservice architectures. Through the analysis we identified and classified works, providing a thorough examination of methodologies and tools for discovering web services. Our review highlights the fragmented nature of current research efforts and underscores the need for a unified understand of service discovery techniques. More, we discuss the empirical evidence and for future research to develop the effectiveness and quality of services discovery mechanisms. [4]

Customers often use web-based systems for online booking and reservation of flights, as do travel companies. Since airline tickets get more expensive over time, most consumers would rather schedule their travels as far in advance as possible to take advantage of the best deals. The suggested study presents a quality of experience (QoE)-based approach to improve user satisfaction in situations when clients may be penalized for changing their flight plans, which could result in the loss of promotional tickets. In order to tackle this difficulty and maintain a balance between client satisfaction and service provider (SP) profit, an early booking assurance service called as a cancellation protection service (CPS) is developed [5]. Three unique models are included in this CPS framework: Fixed CPS, Flexible CPS, and QoE-based CPS. The QoE-based CPS technique uses the Analytic Hierarchy Process (AHP) to give various criteria the proper weights. Customers who choose to cancel their tickets through the recommended CPS technique may be eligible for a refund under certain circumstances[5]

This article talks about how buildings nowadays connect to systems like energy management, IoT devices, and more. it's hard to make all these systems work together properly. This article proposes a new way of organizing these systems called a service-oriented architecture. It's like breaking things down into different categories of services to make everything more flexible and scalable. It is even tested out with three smart building applications, like one that combines sensor data and 3D building models. It's a big step towards making buildings smarter and more efficient. [6]

this paper is all about how important web services and browsers have become in our daily lives, but with that comes a bunch of security threats to our data. the paper suggests a cool method called multi-dimensional browser fingerprint detection, which identify who's accessing what on the web. They also came up with a nifty access control framework that combines this fingerprint detection with web services. But using different browser features and some fancy adversarial learning techniques, they made this method accurate ,even with just a small number of user samples. they tested it out on some open source data sets to prove its effectiveness.

This allows for a more nuanced understanding of the database structure, enabling the system to better interpret and respond to natural language queries.

Additionally, we go beyond just identifying table and column names by incorporating actual database values into the prediction model. This enables the system to dynamically synthesize SQL statements that accurately reflect the user's intent, even when expressed in natural language [8]

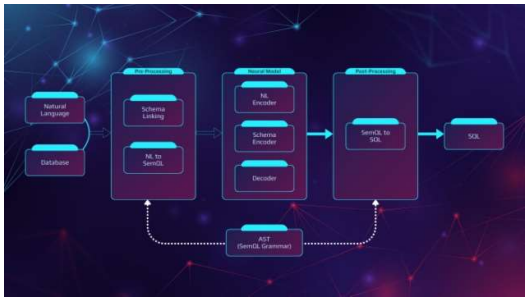


Figure 2 Query search model

There is a lot of interest in Blockchain technology because of its potential to change many aspects of society and the economy. Although the majority of the early research was on its application in crypto currencies like as Bit coin, there has been an increasing amount of interest in its usage in the public sector[9].This study provides the first comprehensive review of the literature on Blockchain technology's possible applications to all major public services. It identifies important industries—such as regulatory frameworks, welfare distribution, and administrative procedures—where Blockchain technology may have a major positive impact.

The review describes the possible costs, advantages, and disadvantages of Blockchain adoption for people, government employees, and civil servants. Governments have difficulties including regulatory ambiguity and scalability constraints, but they also stand to benefit from increased efficiency and openness. Government employees may benefit from less red tape and more interagency cooperation, but there is a barrier because they are not familiar with Blockchain technology. Although there are still worries about data security, improved security and transparency are important advantages for citizens. The article's conclusion acknowledges the shortcomings of the present research and offers potential topics for future study in an effort to direct future research in this developing field. [9]

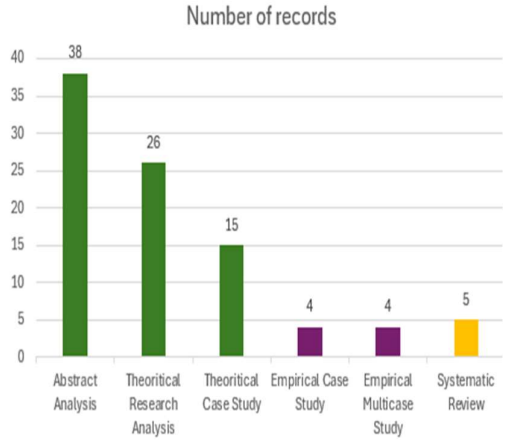


Figure 3 Comparative analysis

In the field of computer services, suggesting the appropriate web service to users is crucial but also challenging. Recently, in an effort to address issues such as data scarcity and cold start recommendations, researchers have been investigating the use of additional data found in the vast realm of web services. Some have begun utilizing sophisticated methods, such as deep learning, to gather information from several sources and gain a deeper understanding of both users and web services. But there's a catch: these approaches don't always work well for maximizing the variety of information in a way that is understandable, systematic, and flexible[10]. To address this issue, our study introduces a new paradigm called MGASR. The framework possesses the intelligence to automatically extract valuable insights from the diverse range of online service data available. By layering these insights, MGASR is able to understand the context around each web service very well, using information from multiple sources. This means it can offer web service recommendations that are really insightful and useful. We tested MGASR with real data and found that it works better than other existing methods. [10]

This study looked at 4,035 articles about web services and cloud computing found in the Web of Knowledge database from 2010 to 2019. The researchers found that about 29% of the work done in this area was by groups of authors working together. A standout contributor,

Alexandru Iosup and his team, had their work cited quite a lot, showing a significant impact with an average citation rate of 44.10% per paper, and their articles appeared in a journal that has a high rating (impact of 5.768) called Future Generation Computer Systems. The research on web services and cloud computing is published in various places, but the three top open access journals make up two-thirds of all the research published. This means a lot of the findings are freely available to anyone interested [11].When it comes to who's contributing most to this field, universities are at the forefront. Notably, Tsinghua University, Wuhan University, the Chinese Academy of Science, and the University of Melbourne in Australia have been particularly active. Between 2004 and 2013, India was also a significant contributor, producing 5.66% of the global research output on these topics and ranking fourth worldwide.

This research helps us understand how much attention web services and cloud computing are getting globally. It highlights the key contributors and institutions driving this field forward, showing how cloud computing is becoming an essential part of the tech landscape [11].

Recommending the right web service to users is very important but also quite difficult in the world of computing services. Lately, to solve problems like not having enough data or figuring out what to recommend to new users (cold start), researchers have been looking into using extra information available in the diverse world of web services. Some have started using advanced techniques, like deep learning, to better understand both users and web services by pulling in data from various places. However, there's a problem: these methods aren't perfect at making the most of all this varied information in a clear, organized, and adaptable way. [12]

To address this challenge, our paper introduces a new framework called MGASR. This framework is smart enough to automatically pull out useful insights from the mixed bag of web service information out there. Then, with the help of graph neural networks (GNNs) that pay special attention to certain details, it builds layers of this model to dig deep and find various important connections between these nodes [12]. By layering these insights, MGASR is able to understand the context around each web service very well, using information from multiple sources. This means it can offer web service recommendations that are really insightful and useful. We tested MGASR with real data and found that it works better than other existing methods.

Objectives

- Extracting latent factor from user query for different requirements to search on public repositories on web.
- To make an efficient mechanism and Computing model that enables Discovery of Web Services with different formats from different repositories on web.

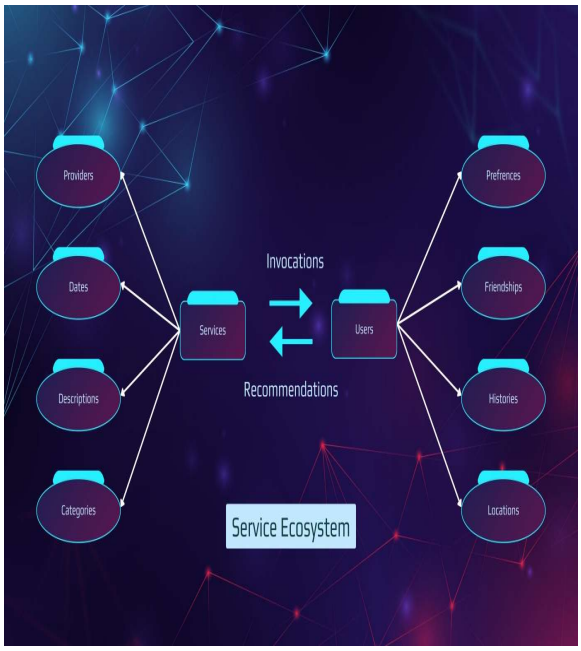


Figure 4 Web Service discovery ecosystem

The way we build software is getting better and faster, thanks to something called Service-Oriented Computing (SOC). SOC is a way of creating software that uses Web services (think of them as building blocks) to put together new applications that do exactly what we need them to do, and do it well. This paper talks about a fresh way to make these applications by smartly combining these Web services [13].

Pick the Best Web Services: We use a special method called Formal Concept Analysis (FCA) to choose the best set of Web services that fit together nicely[13]. Make Sure They Work Well Together: We use another technique called Relational Concept Analysis (RCA) to make sure these Web services can work in a sequence without needing a lot of changes.

Check Our Work: Finally, we test these newly built applications to make sure they're running as expected. We tried this approach with a huge collection of Web services (over 10,830 of them!) from different areas. The results? Our method is really good at putting together Web services in a way that meets a wide range of needs, both in terms of what the application is supposed to do and how well it does it. [13]

There is various information available on the web about the techniques and methods for improving web services and overcoming the challenges. Researchers are working on a number of research works to improve the effectiveness and efficiency of online service availability.

In this paper we have discussed the work done by nobel personality using the machine learning techniques. Machine learning can be used to obtain accurate estimations the major benefit of using machine learning is that it can run from the training dataset well. We hope this research paper will help the researchers in carrying forward their work in machine learning field and also gives insight of future trends related to this field [14].

Multiple, logically connected services are combined to create a composite Web service, which meets consumers' complicated requirements by producing a more common service. The services participating in a composition coordinate the actions of their scattered activity to reliably agree on the outcome of the joint operation with the aid of Web services protocols. Still, there's a good risk that services will fail because of protocol failure because they operate across unstable protocols. Though they are confined to backward recovery through costly compensation and roll-back techniques, current protocol standards offer fault-tolerance. In this

paper, a forward recovery strategy to failure handling is provided for the Web services business activity (WS-BA) protocol. Recovery options are also provided for each failure type found, along with a list of typical failure kinds that impact the operation of component services. For every failure that is found, recovery solutions are implemented by the WS-BA protocol's fault-handling extension in order to address problems at runtime. Getting to a consistent conclusion and informing others of it after collaborative work is finished is another crucial area where the WS-BA protocol specification is ambiguous. The framework is implemented and verified with the help of the model-checking and verification tool UPPAAL. An established application case lends credibility to the research. Verification is done on the framework's essential features, such as achieving a consensus on the outcome of cooperative operation and carrying out recovery activities in the event of failures [15].

In order to achieve new business goals, service discovery infrastructure automatically integrates online services. The service requestor, service broker, and service provider are its three main actors. The broker delivers the service that the registry has requested. The procedure of looking for services is really challenging. The services' non-functional features as well as their functional parts ought to mesh well.

Many studies have been conducted in an attempt to identify the appropriate services for integration. The same collection of services may be requested frequently by several requestors, or one requestor may require the same set of services. In this work, I present a model that supports service discovery by utilising the historical data about the current set of services required to carry out a business goal. The task details are present along the broker side. [16]Design of digital filter by differential evolution[21]

The research work WICHAI (WebservICes platform for Phuket tourism based on ontologies) suggests a new ontology-based tourism platform. With the use of this platform, travelers who do not know Thai can more quickly and easily get relevant and accurate online results for their searches. The Language ontology, UserProfile ontology, and PhuketTourism ontology are the three ontologies that work well together in the WICHAI platform. To identify the most relevant terms, transliterated word processing is offered. The accuracy of the results, relevant keywords, and visitor satisfaction are the main factors that determine the rating. Based on how accurate the results are, output similarity will be linked to either the Language, Phuket Tourism, or User Profile ontologies [17].

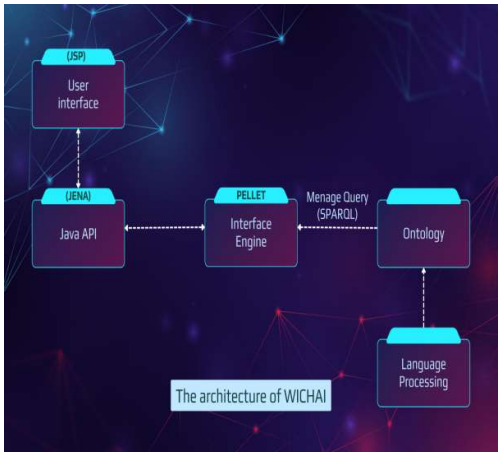


Figure 5 The architecture of WICHAI for web services

The development of client applications is accelerated by REST Web Services, a scalable, lightweight, and maintainable service. These services' antipatterns are insufficient and

ineffective design solutions. They've got generated a great deal of quality issues with REST web service evolution and maintenance. This research suggests utilizing genetic programming (GP) as an automated method for REST web service antipattern detection. Consideration is given to three kinds of metrics: general, REST-specific, and code-level. A total of twelve antipattern kinds are looked at. The manual rule-based technique and the outcomes are contrasted. The statistical analysis demonstrates that the proposed method effectively identifies REST ant patterns, achieving an average precision of 98% (95% CI, 92.8% to 100%) and a recall score of 82% (95% CI, 79.3% to 84.7%) [18].Design differential evolution algorithm that effect on order of digital filters[22].

In a context with limi the need for mobile cloud services (MWS) grows, finding the appropriate MWSs to meet service requests is a major challenge in the WS lifecycle, and this is where the WS discovery process comes in. This discovery process is a resource-intensive task that cannot be successfully finished in a mobile computing environment due to the limitations of mobile devices. In the meantime, because cloud computing has infinite and easily expandable resources, it can offer rich computing resources for mobile contexts. This study presents a cloud-based, relationship-aware matching algorithm-based semantic web services (WS) discovery and invocation framework for mobile contexts The discovery method adds semantically to MWS and user requests the functional and non-functional aspects of Ontology Web Language for Services, like Quality of Web Service, device context, and user preferences. The WS repository is filtered using logical reasoning and a parameter-based matching technique to minimize the matching space and improve runtime efficiency. The cosine similarity between the user request and services repository is then assessed in order to determine which WS is the most relevant. Recall and precision ratio are expected to rise as a result of the ontology's relationships between concepts. After going through the WS discovery process, users can launch and test these services in a mobile context using a dynamic user interface. In accordance with the WS description paper, the invocation process's interface is modified. To assess the framework, an application prototype built on a Cordova cross-mobile development framework is also created.ted resources, Web services (WS) offer an excellent way to facilitate the interoperability of various system types while lowering the overhead of complex processing [19].Design of Digital Filter by Genetic Algorithm[23].

This study examines the topic crawler-based Web information data mining technique. In addition to introducing the main technology and operating concept of the architecture, this paper presents the architecture of Web information search and data mining. This paper first looks at the benefits and drawbacks of a typical crawler before concentrating on the functionality, deployment approach, and performance evaluation of this specific crawler. It also goes into how this specific crawler is different from others and how data mining and Web information search tools use it. According to the experiment's findings, the crawler can access a wide range of online information resources, which is beneficial for managing and keeping an eye on network cultural content. [20, 25]Design and experimental analysis of a closed-loop autonomous rotary hydroponics system for revolutionizing fenugreek yield and enhancing food security[25].

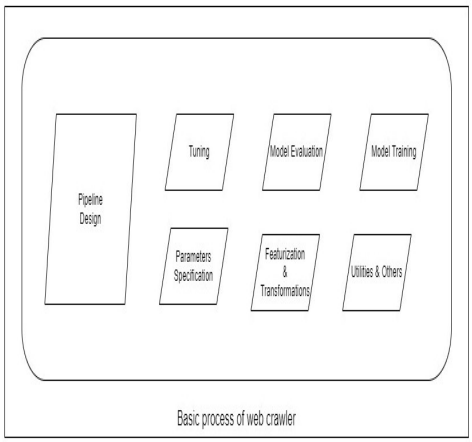


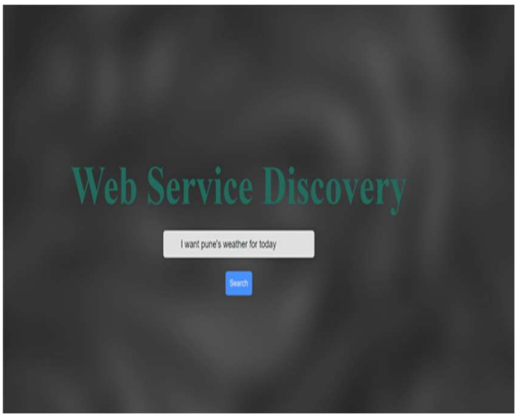
Figure 5 Basic process of web crawler

Results

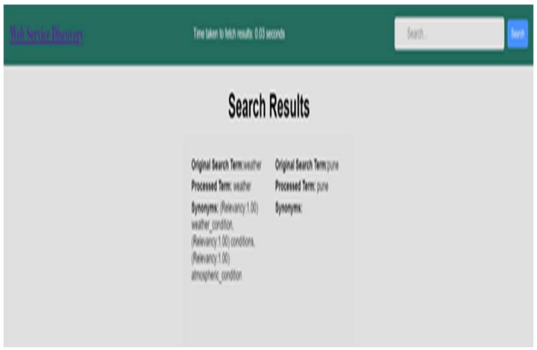
Here is a comparative analysis of UWSDRA (Unified Web Service Discovery and Ranking Algorithm) against other well-known algorithms like Latent Semantic Analysis (LSA), Vector Space Model (VSM), and Keyword-based Search. We can compare them based on a number of factors, including efficacy, efficiency, scalability, and accuracy in web service discovery and ranking.

Result: Web service discovery and computing model will encourage developers to develop open source web services which can be used by others freely for different applications.

UWSDRA model is the novel approach and better option for other web service discovery approaches. Below are some snaps for working demo model



(a)



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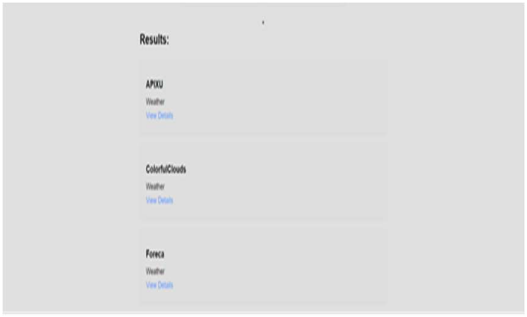

(c)

Figure 6 UWSDRA will work on searching (a, b, c)

Accuracy

- UWSDRA: By combining semantic similarity and score, UWSDRA combines with semantic search, Okapi BM25, and PageRank to provide an accurate and similarly relevantresult.
- VSM: VSM is less accurate since it depends on the total number of words model and cosine similarity, which are not 100% effective given the imperfect semantic relationship.

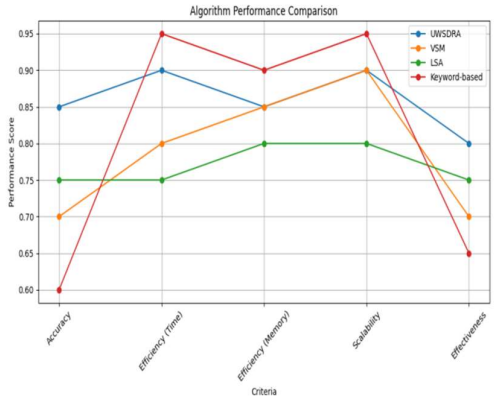

Figure 5 Comparison of UWSDRA VS -LSA, VSM, and Keyword based Search

CONCLUSION

For the success of any web service which is published, it is depending on how efficiently it is discovered. A variety of Web Service Discovery models are available to help achieve faster and more accurate results. Paper defines previous work as well as numerous approaches

existing related to the discovery of Web Service. The approaches are syntax or semantic based, from which some are using clustering, cohesion, vector space model, latent factor model to discover the web services. We have provided an overview of some approaches which are available for web service discovery, and it will help to modify current approaches and to develop new web service discovery techniques in future. Also, this research will promote awareness among developers about the publishing free web services on the web.

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