

Evolution of Natural Language processing techniques for image retrieval

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Abstract: *In this paper, we present an overview of generalise current trends in NLP and discuss the possible applications of NLP techniques for image retrieval area. The field of natural language processing originated approximately five decades ago and today, NLP is grow rapidly with many recent computer areas.*

Natural Language processing is a major area of artificial intelligence research, which in its turn serves as a field of application and interaction of a number of other traditional AI areas. Recently, NLP research moved toward dominance of very large-scale applications of statistical methods, such as machine learning, image mining. Natural Language Processing has significantly contributed to the field of human-computer interaction in terms of theoretical results and practical applications.

Natural language processing is an area of research which works to reduce gap between human and machine. This gap is semantic gap and this gap is reduced with the help of natural language processing techniques. NLP closely related to many important field of computer science like artificial intelligence, information retrieval and That is, NLP is basically tried to solving the central artificial intelligence problem—making computers as intelligent as people, or strong AI. NLP's future is closely related to primary and realistic research in artificial intelligent, image mining and retrieval.

Basically, in this paper, we discuss the field of natural language processing as it relates to different area of computer by focusing on its interactive application areas and primarily focus on NLP use in image retrieval systems.

Keywords: *Natural Language processing, artificial intelligence, image mining, machine learning, image retrieval. Artificial intelligence*

I. INTRODUCTION

Natural language concepts guide the interpretation of what we see, hear, read, or experience with other senses [10].

Natural Language processing involves various field of computer computer science, artificial intelligence, and linguistics concerned with the interactions between computers and human (natural) languages. Basically, natural language processing techniques try to reduce human-machine gap.

NLP techniques are useful for enhancing semantically the discovery process of web services.

II. NEED NATURAL LANGUAGE PROCESSING

Natural Language Processing is a way that creates bridge between machine and human and hence tries to reduce the distance between human and the machine .Therefore with the help of simple human sentence, NLP make human able to directly communicate with machine easily.

In image retrieval, human language based user query is process by means of natural language processing. Recent activities in multimedia document processing like automatic annotation and content extraction out of images and audio, video could be seen as information extraction. Similarly, information retrieval is the process which is based on user's query.

Natural language processing is decisive for advancing healthcare because it transforms significant information locked in text into structured data that can be used by computer processes for improving patient care and advancing medicine.

Natural language processing is a basic requirement for advanced knowledge-based systems since the ability to acquire, retrieve, exploit, and present knowledge critically depends on natural language and production.

Natural Language Processing and natural Programming Languages are both conventional areas in Computer Science, both, Natural language processing and natural Programming Languages are work on one common theme i.e. languages. With recent NLP techniques, both are improved and simplified.

III. RECENT RELATED WORK ON NLP

In this section, we focus on use of natural language processing techniques to various computer application areas. NLP used in medical field like for IDS for generating simple Discharge Summary report to developing BioMedLEE system that automatically extracts biological information consisting of biomolecular substances and phenotypic data . Natural language processing technique is used in Understanding and analysis software requirements, discovery of services from a huge web service that meet users requirement. This means

natural language processing try to touch every aspect of human life.

Past Natural Language Processing techniques are used to identify candidate links. Because many NLP techniques exist and their performance varies according to context, it is critical to define and use reliable evaluation procedures. A set of seven principles are proposed for evaluating the performance of NLP techniques in identifying equivalent requirements[1]. These NLP techniques perform on a given dataset according to both ability and the odds of identifying equivalent requirements correctly. For instance, when the odds of identifying equivalent requirements are very high, then it is reasonable to expect that NLP techniques will result in good performance. Key idea is to measure this random factor of the specific datasets in use and then adjust the observed performance accordingly.

Natural language processing technique is used in Understanding and analysis software requirements [2]. As it is a crucial task in software development projects. Transforming "natural" software requirements into a more formal specification may therefore reduce their ambiguity and incompleteness. A method is used to transform software requirements specified in a natural language to formal specification. This transformation proposed method uses single Natural Language Processing Techniques.

Requirements Analysis and Class Diagram Extraction is natural language processing system [3]. A RACE is a desktop instrument which is developed with the help of natural language processing techniques. To assist requirements analysts and SE students in analysing textual requirements, finding core concepts and its relationships, and step by step extraction of the class diagram. The evaluation of RACE system is in the process and will be conducted using two forms of evaluation, experimental and expert evaluation.

Today, it is really difficult to discovery of services from a huge web service that meet users requirement, becomes a major challenge. In order to overcome this problem, two natural language processing techniques are help to extract semantic information from textual descriptions of Web services, Linguistic patterns and extraction rules. Both techniques are implemented and compared in order to select the best alternative to the problem [4].

A system developed for automated classification of NASA anomalies is based on natural language processing techniques [6]. Data of NASA database are often captured in natural language that is not appropriate for trending or statistical analyses. This fast abstract describes a feasibility study of applying sixty natural language processing techniques for automatically classifying anomaly data to enable trend analyses.

Natural language processing techniques are used to address Requirements Engineering problem like deal with change management, which is required to ensure that the final product reflects the stakeholders' expectations, namely the client and

end-users business-related needs and requirements development process. So, researcher proposes a new socio-technical approach to overcome these software quality problems, consisting on the deep integration of Requirements Engineering with Model-Driven Engineering processes. This approach is based upon a controlled natural language for requirements specification, supporting the automatic extraction and verification of requirements models with Natural Language Processing techniques [7].

A Formative Model is develop with the help of natural language processing techniques such as Segmentation, Stemming and Stop word Filtering in order to reduce the time for generating the DSR[8]. Many organizations and healthcare providers are concerned on implementing new tools and applications to improve the quality of the provided services and to speed up the processing time. Discharge summary report is one of the curtail reports that consumes the physician efforts and time to integrate it. Only limited researches exist on automating the integration of DSR, which is based on combining various patient data from his/her Hospital Medical Reports . The intention for this paper is to construct a formative model for constructing Intelligent Discharge System (IDS) automatically without human intervention. Method: DSR integration composed of text summarization technique which provides the ability to extract an important data from a large size of text that collected from several parts of patient's HMR. The system with NLP showed an impressive improvement in DSR automated production.

Studying the text messages of a user such as in facebook or Twitter can help in detecting his topics of interests. User in Social Network Systems posts text messages about a wide diverse of topics. Posts usually written in a non-standard language, which make it not applicable to the standard Natural Language Processing techniques used to catch the relations between words in text. In many cases there are semantic relations between the contained entities of posts that can infer the interest of the user. An Interests Discovery Approach proposes a technique to discover the implicit semantic relations between entities in text messages, which can infer the interests of a user. The proposed technique based on a semantically enriched graph representation of entities contained in text messages generated by a user [9].

With the help of natural language processing techniques, Opinion mining or sentiment classification system is achievable, aim to extract the features on which the reviewers express their opinions and determine they are positive or negative. Combination of Natural Language Processing techniques , ontology based on Formal Concept Analysis design, and Support Vector Machine is used for classifying the software reviews are positive, negative or neutral [11].

MEDLINE is a huge database of biomedical information and life sciences [12]. It provides information in the form of abstracts and documents. However, extracting this information leads to various problems, related to the types of information such as recognition of all terms related to the domain of texts,

concepts associated with them, as well as identifying the types of relationships. Extraction of drug-disease relations from MEDLINE abstracts is a new approach to extract disease-drug relations: a first step employs Natural Language Processing techniques for the abstracts' pre processing and second step extract a set of features from the pre processed abstracts. Finally we extract a disease-drug relation using machine learning classifier.

A number of natural language processing systems are available to automatically extract information from genomic literature. One existing NLP system, known as BioMedLEE, [13] automatically extracts biological information consisting of biomolecular substances and phenotypic data. This system focuses on the adaptation, evaluation, and application of BioMedLEE to the molecular imaging domain. In order to adapt BioMedLEE for this domain, an existing molecular imaging terminology extended and incorporates it into BioMedLEE. BioMedLEE's performance is assessed with a formal evaluation study. The system's performance, measured as recall and precision.

In light of the importance of NLP to health, NLP techniques develop system that use Library of Medicine (NLM) in English[14], both in biomedicine and in the general language domain and design strategies for advancing the field, and obstacles that need to be addressed, resulting in suggestion for a research agenda intended to advance the field.

Temporal information is crucial in electronic medical records and biomedical information systems. Processing temporal information in medical narrative data is a very challenging area. It lies at the intersection of temporal representation and reasoning in artificial intelligence and medical natural language processing [15].

IV. OVERVIEW OF NATURAL LANGUAGE PROCESSING TECHNIQUE

There are several basic techniques used in analysing natural language processing like Pattern matching, syntactically driven Parsing, Semantic Grammars. Some of them can be briefly described as follows.

a. Pattern matching

Pattern matching is an idea where is an approach to natural language processing is to interpret input utterances as a whole rather than building up their interpretation by combining the structure and meaning of words or other lower level constituents. That means the interpretations are obtained by matching patterns of words against the input utterance. For a deep level of analysis in pattern matching a large number of patterns are required even for a restricted domain. This problem can be ameliorated by hierarchical pattern matching in which the input is gradually canonicalized through pattern matching against subphrases. Another way to reduce the number of patterns is by matching with semantic primitives instead of words.

b. Syntactically driven Parsing
syntax means ways that words can fit together to form higher level units such as phrases, clauses and sentences. Therefore syntactically driven parsing means interpretation of larger groups of words are built up out of the interpretation of their syntactic constituent words or phrases. In a way this is the opposite of pattern matching as here the interpretation of the input is done as a whole. Syntactic analyses are obtained by application of a grammar that determines what sentences are legal in the language that is being parsed.

c. Semantic Grammars

Natural language analysis based on semantic grammar is bit similar to syntactically driven parsing except that in semantic grammar the categories used are defined semantically and syntactically. There here semantic grammar is also evolved.

d. Case frame instantiation

Case frame instantiation is one of the major parsing techniques under active research today. The has some very useful computational properties such as its recursive nature and its ability to combine bottom-up recognition of key constituents with top-down instantiation of less structured constituents.

V. RECENT APPLICATION OF NLP FOR IMAGE RETRIEVAL

Recent activities in multimedia document processing like automatic annotation and content extraction out of images and audio, video could be seen as information extraction. Similarly, image retrieval is the process which is based on user's query. Human language texts based query is process best by means of natural language processing. Hence, natural language processing techniques are applied for image retrieval.

Image searching and retrieval is rooted in Artificial intelligence, digital signal processing, statistics, natural language understanding, databases, psychology, computer vision, and pattern recognition. However none of these fields can solve the problem of image search alone but the solution lies at the crossroads of these parent fields. A method of Contents Based Image Search is developed where geometrical shapes of the objects in the image are considered as contents of image. In this CBIR system, natural language processing techniques are involved for intellectual and emotional sides of the human interface [16]. Each object is separated from the image by segmentation. Then the geometrical shape of the object is estimated and compared with a predefine set of shapes of different categories. Number of objects in an image and geometrical shape of the objects are used as contents of the image which is used for retrieval and searching. Number on objects in the image is used for first level of indexing in search process.

A natural language processing techniques are applied to content-based video indexing and retrieval to identify appropriate video clips that can address users' needs[17]. The method integrates natural language processing, named entity

extraction, frame-based indexing, and information retrieval techniques to explore knowledge-on-demand in a video-based interactive e-learning environment.

Using Natural language processing, semantic-based approaches can significantly improve image retrieval. a semantic-based create and search technique enhance visual information retrieval. An ontology-based scheme is used for the semi-automatic annotation for image retrieval. Latent Semantic Indexing is used in order to solve the Natural Language vagueness problem and to tolerate ontology imperfections. This framework is able to find indirect relevant concepts in images and to represent image semantics at a higher level.

an approach is invented to interpret image semantics with the help natural language processing , through semi-supervised mining annotated words[19]. Automatic Web image annotation is a practical and effective way for both Web image retrieval and image understanding. However, current annotation techniques are very difficult to get natural language interpretation for images such as "pandas eat bamboo". But, this problem is solved by using NLP.

Web Content extraction is the task of extracting structured information from unstructured and semi-structured machine-readable documents. The Challenges for this type of web page content extraction is increasing now-a-days. problem of automatically extracting the contents from the web pages is partially addressed by natural language processing[20]. Many more researches have been done to address this problem. The existing approaches have some limitations such as that, it has no sufficient power to deal with the large number of web pages and also that they are web-page-programming-language dependent.

Biomedical information exists in different forms: as text and illustrations in journal articles and other documents, in "images" stored in databases, and as patients' cases in electronic health records. Medical image database includes biomedical images as well as illustrations, charts, graphs, and other visual material appearing in biomedical journals, electronic health records, and other relevant databases. To retrieve such images, combination of techniques and tools are used from the fields of Information Retrieval (IK), Content-Based Image Retrieval, and Natural Language Processing [21]. This system automatically finds semantically similar images in image databases, which is an important step in differential diagnosis. Automatic image annotation and retrieval steps will be described that use image features and a combination of image and text features.

As mentioned earlier, human language texts is process best by means of natural language processing. Web Content extraction is the task of extracting structured information from unstructured and semi-structured machine-readable documents. The retrieved information is to be extracted using the web content extraction concept. The Challenges for this type of web page content extraction is increasing now-a-days. Automatic extraction of contents from the web pages is done by using natural language processing techniques [22]. This system deals with information retrieval process in which the Vision based approach is applied, which helps to extract both images and text from the web pages. The extraction is carried out on the basis of visual features of web page. This approach can gain a better performance when compared with other traditional methods.

Natural language processing and image processing is combined for evaluating the performance of the motion classification using data sets captured by a motion capture system[23]. These methods used for semantic motion retrieval in large data sets of human motions to classify body gestures automatically. This method extracts spatio-temporal features from the motions by expressing them in frequency domain. And these features are transformed into the Bag-of-words representation to accelerate the calculation and to emphasize the semantic aspect.

Latest developed CBIR use semantic features selection and representation to be described by the user directly through appropriate verbal descriptions using the natural language concepts [24]. Most image retrieval methods are specialized for image based matching and retrieval based on low-level features. However, humans perceive facial images and compare their similarities using high-level features, such as the description and ranking of facial traits including gender, race, and age. In this manner, the research has strategized to bridge the semantic gap between the low-level image features and high-level semantic concepts.

VI. THE FUTURE OF NLP

Natural language processing is an area of research which works to reduce gap between human and machine. This gap is semantic gap. NLP is related to artificial intelligence, information retrieval and many important field of computer science. That is, NLP is basically tried to solving the central artificial intelligence problem—making computers as intelligent as people, or strong AI. NLP's future is closely related to primary and realistic research in artificial intelligent, image mining and retrieval.

VI. CONCLUSIONS

In this paper, we have focused on recently developed natural language processing techniques. There are a set of NLP techniques, some basic and others more advanced. Each natural language processing techniques can be practically useful in a variety of ways to improve multiple areas of human life, including personal development, business, communication, health, education and therapy.

As there is advanced development in natural language processing techniques, computers will be become more intelligent like human being in sense of oral communication and apply that knowledge to the real world. Computers will become more and more interactive and user friendly.

We conclude that natural language processing techniques and systems is available now, but that in the probable future the improvement of NLP systems are needed to make human and computer communication as face-to-face communication.

NLP is more appropriately use for bridging semantic gap in image retrieval. There are lots of researchers are working on NLP to study natural language processing techniques to develop more realistic and useful NLP systems.

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