

Example Based Machine Translation Using Various Soft-Computing Techniques Review

Manish Rana, Mohammad Atique

Abstract— This paper focus on the various techniques involved in machine translation (MT).The various techniques involved in machine ignore many aspects when they generate natural language processing (NLP). An optimization technique was one of the major tools for many years in the formulation and solution of computational problems arising in speech and language processing. One of the methods, phrase-based SMT consists of three steps: segmentation of source sentences into a sequence of phrases, translation of each source phrase to a target phrase; and reordering of target phrases into target sentences. Further a Fuzzy Inference system model is used selecting the optimal features from speech vectors. The most fundamental problems in the field of machine learning are Feature selection. Fuzzy logic plays the major role in approximate reasoning. It has the ability to deal with different types of uncertainty, the implementation of the theory to real life problems. A linguistic variable, as its name suggests, is a variable whose values are not numbers but words or sentences in a natural language. Convex optimization problems are formulated and solved, with analytical formulas derived for training the ensemble-learning parameters. The result shows that above mentioned techniques were effective to certain limit which have not yield the proper translation in case of NLP. Thus this paper proposes an idea for under the heading “example based translation using soft-computing tool” like fuzzy logic implementation to yield successful NLP.

Index Terms— Machine Translation, Natural Language Processing, linguistic variable, Fuzzy Inference system etc.

I. INTRODUCTION

A soft computing (SC) tool plays a major role in machine translations. Soft computing (SC) solutions are unpredictable, uncertain and between 0 and 1. In machine learning soft-computing have contributed to an extend like in support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new examples into one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible.

Fuzzy logic is a form of many-valued logic which deals with reasoning that is approximate rather than fixed and exact. Compared to traditional binary sets (where variables may take on true or false values); fuzzy logic variables may have a truth value that ranges in degree between 0 and 1. Fuzzy logic has been extended to handle the concept of partial truth, where the truth value may range between completely true and completely false. Furthermore, when linguistic variables are used, these degrees may be managed by specific function.

Another application or technique is particle swarm optimization (PSO) is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. PSO optimizes a problem by having a population of candidate solutions, here dubbed particles, and moving these particles around in the search-space according to simple mathematical formulae over the particle's position and velocity. Each particle's movement is influenced by its local best known position but, is also guided toward the best

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known positions in the search-space, which are updated as better positions are found by other particles. This is expected to move the swarm toward the best solutions. Thus high light certain techniques in soft-computing.

II. LITERATURE SURVEY

Speech Recognition for Voice-Based Machine Translation

In this paper author talk about Machine translation (MT) [1] is a subfield of natural language processing that find the use of software to translate text or speech from one natural language to another. It can be especially useful for performing tasks that involve understanding and speaking with people who don't speak the same language. In the global software engineering (GSE) domain, for example, language is an important factor in the success of offshore IT work in countries with strong English language capabilities, such as Ireland, the Philippines, India, and Singapore joint layer based deep learning framework for bilingual machine transliteration joint layer based deep learning framework for bilingual machine transliteration between the growth of internet or world wide web (www) and the emersion of the social networking site like Friendster, MySpace etc., information society started facing exhilarating challenges in language technology applications such as machine translation (MT) and information retrieval (IR). Many researchers have used approaches such as conventional graphical models and also adopted other machine translation techniques for machine transliteration. Machine transliteration was always looked as a machine learning problem. In this paper, the author presented a new area of machine learning approach termed as a deep learning for improving the bilingual machine transliteration task for Tamil and English languages with limited corpus. This technique precedes artificial intelligence. The system is built on deep belief network (dbn), a generative graphical model, which has been proved to work well with other machine learning problem. We have obtained 79.46% accuracy for English to Tamil transliteration task and 78.4 % for Tamil to English transliteration.

Optimization algorithms and applications for speech and language processing

In this paper author talks about Optimization techniques [2] have been used for many years in the formulation and solution of computational problems arising in speech and language processing. Such techniques are found in the Baum-welch, extended Baum-welch (ebw), rprop, and gis algorithms, for example. Additionally, the use of regularization terms has been seen in other applications of sparse optimization. This paper outlines a range of problems in which optimization formulations and algorithms play a role, giving some additional details on certain application problems in machine translation, speaker/language recognition, and automatic speech recognition. Several

approaches developed in the speech and language processing communities are described in a way that makes them more recognizable as optimization procedures. Our survey is not exhaustive and is complemented by other papers in this volume.

Optimization Algorithms and Applications for Speech and Language Processing

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Knowledge based machine translation

In this paper author talks about Machine translation, [4] a part of computational Linguistics, belongs to Natural Language Processing (NLP) and is a hot issue in the computational society. Gap between the linguist and the computer programmer, gives birth to so many problems like lexical ambiguity, syntactic and structural ambiguity, polysemy, induction, discourses, anaphoric ambiguity and different shade of meanings. Mostly English-to-Urdu machine translation systems were developed without considering the target language and also semantics are not included in existing systems. This alarming problem generates several issues during Natural Language Processing. Author of this paper, proposed and designed a new Knowledge Based Machine Translation System to overcome the above mentioned problems by using data mining and text mining techniques. Our machine translation system fulfills almost all the requirements of Natural Language Processing and Computational Linguistics. Basically this system is designed for Urdu but it can be used for many other languages. The proposed system will give better results as compared to existing systems.

Machine Translation-A Journey

In this paper author talks a Translation of natural language [5] has always attracted attention of scholars world-wide, be it manual or machine based. Since, the last six decades machine translation has been witnessed. It is attempted in

various Indian and foreign languages. Machine translation has also been attempted with different techniques. The success ratio of translation has always been an encouraging factor, which kept attracting talents and organizations. Therefore, author had seen progress of machine translation by leaps and bounds.

Anusaaraka: an expert system based machine translation system

In this paper author talks about most research in machine translation [6] is about having the computers completely bear the load of translating one human language into another. This paper looks at the machine translation problem afresh and observes that there is a need to share the load between man and machine, distinguish reliable knowledge from the heuristics, provide a spectrum of outputs to serve different strata of people, and finally make use of existing resources instead of reinventing the wheel. This paper describes a unique approach to develop machine translation system based on the insights of information dynamics from paninian grammar formalism. Anusaaraka is a language accessory cum machine translation system based on the fundamental premise of sharing the load producing good enough results according to the needs of the reader. The system promises to give faithful representation of the translated text, no loss of information while translating and graceful degradation (robustness) in case of failure. The layered output provides an access to all the stages of translation making the whole process transparent. Thus, anusaaraka differs from the machine translation systems in two respects: (1) its commitment to faithfulness and thereby providing a layer of 100% faithful outputs so that a user with some training can “access the source text” faithfully. (2) The system is so designed that a user can contribute to it and participates in improving its quality. Further this paper provides an eclectic combination of the spectrum architecture with the forward chaining expert system, allowing use of both the deep parser and shallow parser outputs to analyze the SL text. Existing language resources (parsers, taggers, chunkier) available under GPL are used instead of rewriting it again. Language data and linguistic rules are independent from the core programme, making it easy for linguists to modify and experiment with different language phenomena to improve the system. Users can become contributors by contributing new word sense disambiguation (wsd) rules of the ambiguous words through a web-interface available over internet.

Efficient elicitation of annotations for human evaluation of machine translation

In this paper author talks about [7] a main output of the annual workshop on statistical machine translation (SMT) is a ranking of the systems that participated in its shared translation tasks, produced by aggregating pair-wise sentence level comparisons collected from human judges. Over the past few years, there have been a number of tweaks to the

aggregation formula in attempts to address issues arising from the inherent ambiguity and subjectivity of the task, as well as weaknesses in the proposed models and the manner of model selection. Author continue this line of work by adapting the true skill tm algorithm — an online approach for modelling the relative skills of players in ongoing competitions, such as Microsoft’s Xbox live — to the human evaluation of machine translation output. Our experimental results show that true skill outperforms other recently proposed models on accuracy, and also can significantly reduce the number of pair wise annotations that need to be collected by sampling non-uniformly from the space of system competitions.

English-to-Hindi system description for wmt 2014: deep source-context features for mosses

In this paper author talk about [8] describes the ipn-upv participation on the English-to-Hindi translation task from SMT 2014 international evaluation campaign. The system presented is based on Moses and enhanced with deep learning by means of a source-context feature function. This feature depends on the input sentence to translate, which makes it more challenging to adapt it into the mosses framework. This work reports the experimental details of the system putting special emphasis on: how the feature function is integrated in mosses and how the deep learning representations are trained and used.

Example based machine translation using natural language processing

In this paper author talk about Machine translation (MT) [9] research has come a long way since the idea to use computer to automate the translation process and the major approach is statistical machine translation (SMT). An alternative to smt is example-based machine translation (EBMT). Among machine translation systems, traditional transformational methods are somewhat difficult to construct, as they basically involve hard coding the idiosyncrasies of both languages natural language processing deals with the processing of natural language. The language spoken by the human beings in day to day life is nothing but the natural language. There are many different applications under nlp among which machine translation is one of the applications. In this paper, we describe the example based machine translation using natural language processing. The proposed EBMT framework can be used for automatic translation of text by reusing the examples of previous translations. This framework comprises of three phases, matching, alignment and recombination.

Survey of machine translation systems in India

In this paper author talks about the work in [10] the area of machine translation has been going on for last few decades but the promising translation work began in the early 1990s due to advanced research in artificial intelligence and computational linguistics. India is a multilingual and multicultural country with over 1.25 billion population and 22 constitutionally recognized languages which are written in 12 different scripts. This necessitates the automated machine translation system for English to Indian languages and among Indian languages so as to exchange the information amongst people in their local language. Many usable machine translation systems have been developed and are under development in India and around the world. The paper focuses on different approaches used in the development of machine translation systems and also briefly described some of the machine translation systems along with their features, domains and limitations.

A survey of machine translation approaches

In this paper author talk about Machine translation (MT) [11] plays an important role in benefiting linguists, sociologists, computer scientists, etc. by processing natural language to translate it into some other natural language. The demand of translation has become more in recent years due to increase in the exchange of information between various regions using different regional languages. due to this reason machine translation has become an important research subfield under the artificial intelligence(AI).many approaches have been used in the recent times to develop an mt system. Each of these approaches has its own advantages and disadvantages. The performance of an MT system depends on the approach used to design the system. In this paper author are presenting a brief overview of the mt and various techniques of designing an mt system. Also author are discussing the challenges faced while translating one language into another.. Index terms- machine translation, rule based approach direct approach, transfer based approach, interlinguas approach, hybrid approach, EBMT & SM.

Role of machine translation and word sense disambiguation in natural language processing

In this paper author talk about Natural language [12] is most common way to communicate with each other but sometime people cannot understand other languages to understand different languages machine translation is needed. Machine translation is the best application which helps to understand any other language in less cost and less time. in this some problems are faced by researchers: words which pronounce same but having different meaning, some words spelled different but having same meaning, in some cases combination of words may change the meaning. To resolve such kind of problems wisdom is needed. Word sense

disambiguation is used to understand the correct meaning of the word with respect to context in which that is used; word sense disambiguation is the part of natural language processing. Word net plays an important role in word sense disambiguation. In this paper, author have discussed about the basic concept of natural language processing, machine Translation and word sense disambiguation.

A framework of a mechanical translation between Japanese and English by analogy principle

In this paper author talk about Problems [13] inherent in current machine translation systems have been reviewed and have been shown to be inherently inconsistent. The present paper defines a model based on a series of human language processing and in particular the use of analogical thinking. Machine translation systems developed so far have a kind of inherent contradiction in themselves. The more detailed a system has become by the additional improvements, the clearer the limitation and the boundary will be for the translation ability. to break through this difficulty author have thought about the mechanism of human translation, and have to build a model based on the fundamental function of language processing in the human brain. The following is an attempt to do this based on the ability of analogy finding in human being.

Finding translation correspondences from parallel parsed corpus for example-based translation

This paper [14] describes a system for finding phrasal translation correspondences from parallel parsed corpus that are collections paired English and Japanese sentences. First, the system finds phrasal correspondences by japanese-english translation dictionary consultation. Then, the system finds correspondences in remaining phrases by using sentences dependency structures and the balance of all correspondences. The method is based on an assumption that in parallel corpus most fragments in a source sentence have corresponding fragments in a target sentence.

A syntactic analysis method of long Japanese sentences based on the detection of conjunctive structures

In this paper author [15] presents a syntactic analysis method that first detects conjunctive structures in a sentence by checking parallelism of two series of words and then analyzes the dependency structure of the sentence with the help of the information about the conjunctive structures. Analysis of long sentences is one of the most difficult problems in natural language processing. The main reason for this difficulty is the structural ambiguity that is common for conjunctive structures that appear in long sentences. Human beings can recognize conjunctive structures because of certain, but

sometimes subtle, similarity that exists between conjuncts. Therefore, author have developed an algorithm for calculating a similarity measure between two arbitrary series of words from the left and the right of a conjunction and selecting the two most similar series of words that can reasonably be considered as composing a conjunctive structure. This is realized using a dynamic programming technique. A long sentence can be reduced into a shorter form by recognizing conjunctive structures. Consequently, the total dependency structure of a sentence can be obtained by relatively simple head-dependent rules. A serious problem concerning conjunctive structures, besides the ambiguity of their scopes, is the ellipsis of some of their components. Through our dependency analysis process, we can find the ellipses and recover the omitted components. Author report the results of analyzing 150 Japanese sentences to illustrate the effectiveness of this method.

*A maximum-entropy-inspired parser **

In this paper author present [16] a new parser for parsing down to Penn tree-bank style parse trees that achieves 90.1% average precision/recall for sentences of length 40 and less, and 89.5% for sentences of length 100 and less when trimmed and tested on the previously established [5,9,10,15,17] "standard" sections of the wall street journal tree bank. This represents a 13% decrease in error rate over the best single-parser results on this corpus [9]. the major technical innovation is tire use of a "maximum-entropy-inspired" model for conditioning and smoothing that let us successfully to test and combine many different conditioning events. Author also presents some partial results showing the effects of different conditioning information, including a surprising 2% improvement due to guessing the lexical head's pre-terminal before guessing the lexical head.

Word selection for ebmt based on monolingual similarity and translation confidence

In this paper author propose [17] a method of constructing an example-based machine translation (ebmt) system that exploits a content-aligned bilingual corpus. First, the sentences and phrases in the corpus are aligned across the two languages, and the pairs with high translation confidence are selected and stored in the translation memory. Then, for a given input sentences, the system searches for fitting examples based on both the monolingual similarity and the translation confidence of the pair, and the obtained results are then combined to generate the translation.

Our experiments on translation selection showed the accuracy of 85% demonstrating the basic feasibility of our approach.

Support vector learning for fuzzy rule-based classification systems

In this paper author talk about to design a fuzzy rule-based classification system [18] (fuzzy classifier) with good generalization ability in a high dimensional feature space has been an active research topic for a long time. As a powerful machine learning approach for pattern recognition problems, the support vector machine (svm) is known to have good generalization ability. More importantly, a svm can work very well on a high- (or even infinite) dimensional feature space. This paper investigates the connection between fuzzy classifiers and kernel machines, establishes a link between fuzzy rules and kernels, and proposes a learning algorithm for fuzzy classifiers. The author first show that a fuzzy classifier implicitly defines a translation invariant kernel under the assumption that all membership functions associated with the same input variable are generated from location transformation of a reference function. Fuzzy inference on the if-part of a fuzzy rule can be viewed as evaluating the kernel function. the kernel function is then proven to be a mercer kernel if the reference functions meet a certain spectral requirement. The corresponding fuzzy classifier is named positive definite fuzzy classifier (pdfc). Finally, pdfcs with different reference functions are constructed using the support vector learning approach. The performance of the pdfcs is illustrated by extensive experimental results. Comparisons with other methods are also provided.

A bilingual machine translation system: English & Bengali

In this paper author talk about Natural language is a fundamental thing of human-society to communicate and interact with one another. In this globalization era, we interact with different regional people as per our interest in social, cultural, economic, educational and professional domain. There are thousands of natural languages exist in our earth. It is quite tough, rather impossible to know all the languages. So we need a computerized approach to convert one natural language to another as per our necessity. This computerized conversion among multiple languages is known as multilingual machine translation. But in this paper author work with a bilingual model, where author concern with two languages: English and Bengali. We use soft computational approach where fuzzy if-then rule is applied to choose a lemma from prior knowledge; penn Treebank pos tags and hmm tagger are used as lexical class marker to each word in corpora.

Comparison between various techniques used for machine translation

Table: 1. Comparison of Various Techniques used for Machine Translation.

Table 1 shows the comparison used in various technical work proposed and implemented in different papers & **Table 2** illustrates the comparison of three machine translation

S.No.	Parameter	RBMT	SMT	EBMT	SVM
1	Consistency	High	Low	Medium	Medium
2	Predictable Quality	Good	Similar	Very well	Very Good
3	Out of Domain Quality	Medium	Low	High	Medium
4	Use of Grammar	Yes	No	No	Yes
5	Robust	Yes	No	Yes	No
6	Fluency	Less	Medium	High	Medium
7	Performance	Good	Medium	Good	Medium

techniques, Rule-Based Machine Translation (RBMT), Statistical Machine Translation (SMT), Example-Based Machine Translation (EBMT) and support vector machine(SVM) on the basis of various parameters such as Consistency, predictable quality, Quality of out of domain translation, Use of grammar, robustness, Fluency and performance.

S.No.	Papers Technique	Method	Sequence	Alignment	Result
1.	Bilingual Machine Transliteration (BMT)	×	√	×	√
2.	extended Baum-Welch (EBW)	×	√	×	√
3.	Knowledge Based Machine Translation System (KMST)	√	×	√	×
4.	Statistical Machine Translation (SMT)	×	√	×	√
5.	Example based Machine Translation (EBMT)	×	×	√	×
6.	Machine translation (MT)	√	×	×	√
7.	GIS Algorithm	√	√	×	√

Table: 2. Comparison of various Machine Translation schemes

CONCLUSION

A thorough review of the following papers it is confirmed that the techniques used for machine translation is not appropriate to certain extent. As it does not yield the proper machine translation. The better version can be implemented to get the approximate result.

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