Sentimental Analysis Challenges in Persian Language

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Abstract. The rapid growth in data on the internet requires a data mining process to reach a decision support insight. Persian language has strong potential for deep research in any aspect of natural language processing especially sentimental analysis approach. Thousands of websites and blogs updates and modifies by Persian users around the world that contains millions of Persian context. This range of application requires a comprehensive structured framework to extract beneficial information for helping enterprises to enhance their business and initiate customer-centric management process by producing effective recommender systems. Sentimental analysis is an intelligent approach for extracting useful information from huge amounts of data to help an enterprise for smart management process. In this road, machine learning and deep learning techniques will become very helpful but there are number of challenges which are face to them. This paper tried to present and assort most important challenges of sentimental analysis in Persian language. This language is an Indo-European language which spoken by over 110 million person around the world and is official language in Iran, Tajikistan and Afghanistan. It’s also widely used in Uzbekistan, Pakistan and Turkish by order.

Keywords: Sentimental Analysis, Text Mining, Persian Language Challenges

1 Introduction

In this day and age, data known as the most important asset to the various types of large scale, medium and small enterprises around the world. We’re living in data age.[1] Text data is ubiquitous and growing quickly. The web, blogs, emails, social networks provides millions of data in seconds, all of these resources can be a beneficial and powerful base for extracting knowledge. It’s called the power of text analysis. Twitter is a “what’s up” social network platform, thus user’s tweets are precious for application in governments or various types of business to become more familiar with what goes on around and then decide base on truth not on personal taste.

Although determination of truth from the fake news as another research field relates to the text analytic. Proverbially in the dollar rapid increase in Iran twitter could be so effective to analyze user’s tweets and what’s happened around it but lack of comprehensive analysis program became a challenge. Data can eliminate the high level problems. Great companies in the world like Google, YouTube, Apple and Amazon utilize text mining techniques to study on user’s comments and replies to gain a superior realization of customer’s activity. Currently social network platforms are under scrutiny of
many academic researchers and developers to create automatic users comments extractors’ tools, the topic is widely used in various political, social, commercial and industrial aspects[2]. The application of text analysis goes further, now politicians are in the road of acquisition of data sources to gain the superior seat or stabilize their position. Working on sentimental analysis and opinion mining absolutely effects not only NLP but also management, economic, politic, social and every science affected by peoples [3][4]. Nowadays researches on sentiment field can be classified into objectivity and subjectivity. Objectivity sentences describes facts. The purpose is opinions assortment into Neutral and non-neutral including positive and negative opinions. This paper tries to classify most popular text processing challenges in Persian language in both structure and semantic aspects.

2 Sentimental Analysis

Sentimental analysis is an interdisciplinary field tries to familiar machine and artificial intelligence with human emotion. It is the extraction process of useful information from the writer’s beliefs and viewpoints in a specific domain of texts. The topic is one of the most pursued exploration field in NLP in recent years. [5] It also has a key application in web and data mining specially when needed to implement a recommender system which can help the customers to buy their favorite products by proposing best fit ones for them. It is also guide the business and brands to represents best service collection for their consumers. Most of research around sentimental analysis is around English language and many challenges discussed many times in many articles, but unfortunately Persian language doesn’t get mentioned by researchers around the world as much as it really deserved. Since 2000 classification algorithms in data mining utilized for opinion mining[6][7][8]. Bag of words usage was high considered by the time.[9]. At the moment usage of web content and social networks platforms gained lots of interests for automation machine learning among researchers and developers around the world[10][11]. Sentimental analysis levels divide into four: 1) data gathering from social network 2) Data preprocessing 3) Positive and negative classifier 4) Feature selector.

3 Machine Learning Application

One of the moist important challenge in sentimental analysis is lack of labeled data for machine learning. Data gathering for study on the filed needs cost much time because for ensure of labels correctness each data must be labeled by several person.in[12] tried to Use the rule-based method to create machine learning data. In ML Supervised learning which use trained labeled data unlike unsupervised Application is in both structured data and unstructured data. Structure data means a database of data and each of a sample object features has a very well defined in meaning aspect. On the other hand unstructured data refers to an instance you might want to detect what’s in the sample sequence of a text collection. In this case, the features can be specific word in a piece of text. As it is obvious understanding unstructured data comparing to the structured data is much
harder for computers to detect their instances in the real world but with the help of deep learning and neural network, this process is become much easier recently especially in NLP. Although Neural Networks plays an important role in structured data such as much better recommender system and capability to process the massive databases that many brands have to make better prediction result from them. But it appears that the key success role of Neural Network will become more highlighted in unstructured data. The advantage[13] of utilizing machine learning approach are that Using dictionary is not essential at all and they’re Representing high accuracy in word classification.

4 Deep Learning Utilization in Sentimental Analysis

Deep learning application in NLP started with language models. The purpose of LM is to find existence possibility of sequence of words and symbols like letters, characters or language sounds. It must be mention that utilization of deep learning in NLP doesn’t reach progress range of pattern recognition and computer vision[14][15][16]. Most completed activities in NLP by deep learning are training word vectors by LM’s and combine it to other extractable features for classification. Ordinarily text classification consists sentimental analysis can be initiate in one of two ways: supervised learning if there is acceptable amounts of training data and unsupervised learning if there is not satisfied amounts of data to train a deep neural network model. Recursive neural networks are extremely powerful indeed and that’s because they any word as a vector and an operator and it seems so obvious. Consequently the word “not” will be a rotation matrix that operates on the next word (for e.g. Sensational) and alter its polarity by rotating the vector of sensational to now mean not sensational. Thanks to RNN it is a very beneficial concept. Although there will be some requirements for these networks including a lot of training data. Recurrent Neural Networks particularly long short time memory (LSTMS) are very helpful if there will be enough training data which trains a network directly on labels. LSTM handles negation fine, particularly when use the one which has a projection unit in the cell. It can be used for unsupervised training in language model and then using the memory state along with the embedding for classification. Usage of recursive neural network deep learning algorithms will conclude better understand sentiments than traditional method.

Traditional methods isolate words into features and apply different feature selection and dimensionality reductions techniques to select the most significant word in the given input. This is unproductive as it is difficult to train a machine to figure the dissimilarity between the college atmospheres is very nice and the college atmosphere is not very nice.

Most important key concept about deep learning is that it’s allows algorithms to realize sentence structure and semantics. The model is made as a demonstration of the entire sentence based on how the words are ordered and interact with each other.
5 Challenges and open problems in Persian Language

Unfortunately sentimental analysis process in Persian language text is a really difficult process because we’re facing lack of efficient tools and enough resources[17]. The main challenges which sentimental analysis in Persian language is engage to them are need for general mechanisms or tools, Usage of informal idioms and phrases, and also word spacing. [18] Many of following problem hasn’t been solved yet completely and they’re still open to investigate by researchers. The main reason that many of challenges are still remain is that number of works and research In Persian is lack of acceptable quantity of works on it. We already classified the most popular challenges in this section which are:

5.1 Different word space styles
For example “متن ها“ or “متن ها“ can hold a space and be write like “متن ها“ or semi-space and be write like “متن ها“.[19] All of three style of words refers to “passages” in English. Sometimes adding space within a word and omitting space can change the whole meaning of word. For example “چهارراه“ “chahar rah“ with space among it means: “intersection“ but “چهارراه“ “چهارراه“ without any space indicates: “four path“. Sometimes eliminating space[20] among three or four words can cause a problem of determining the words and system recognize them as a single word wrongly. For example consider the sentence “weAlreadyReleasedYou“ which means: we released you, followed words consider by human four unique words but system will face it as a unit token when spaces ignored at all. Complex tokens refers to words incorrect sticking popularity in Persian language among wide variety of people. For example sticking of “این“ and “پیش“ prefixes in “اینبار“ and “پیش“ is example of incorrect sticking issues. [21]

5.2 Lack of standard structure in sentences
Writers utilize complicated sentence structure which doesn’t contain general body of the Persian language structure. Dependent clause can be a good example to be mention. For example “اگرچه دوستم مرا به مهمانی جشن تولدش دعوت کرد اما تصمیم گرفتم به جهت مطالعه برای امتحان فردا در مدرسه به مهمانی نروم.“ In the above passage there are three sentences which are connected strongly to understand the purpose of writer. His intend is “عدم رفتن به جشن تولد“ cancel to go to birthday party“ but it can’t be detect exclusively and writer’s mention is depends on sentence chain.

5.3 Demonstration of imported Arabic letter
In Persian use of Arabic characters instead of Persian format is feasible. A popular mistake is related with letters "ف" and "في" as well as "ك" and "دار". The issues will rise occur when using dictionaries for searching words, making duplication profiles of
words due to the incoherence in encoding. This particular issues cause different outcomes when using keyword based searching[19]. High range usage of Arabic letter such as “Hamza” and “Tanvin” [17] in formal and informal communication among Persian speakers increase every day. Unfortunately we can hear them from daily news presenters and see them on the TV subtitles. The primary issue with these sound is that usage of them is not necessary in writing but if author decide to use them the containing word can have different shapes of writing. For example “جرات”, “جرئت” and “جرات” are all different writing shapes of the word (courage). Another example is “میان”, “میان”, “میان” “میان” and “میان” are all various writing shapes of the word (Staff). The prior two words demonstrate different shape of writing “ء” “Hamza” and last ones shows refusing Hamza. The similar issue arises for “Tanvin” which typically connected to “الف” and is refusing in Persian like “كتاب” and “كتاب” which both means “in writing” or “كتاب” and “كتاب” “انصافان” which both implicates “fairness”.

5.4 Spelling mistakes

Semantic dimension (meaning diversion occurs): Some word often can be written with distinct letters. The problem occurs because in Persian language there are words containing multi-sounds style[17]. Spelling mistakes are too much in Persian language and it changes the meaning of word entirely. For example “حیاط” which can be write like “حیات” implicates a complete different meaning in a sentence. The “حیاط” is refers to “yard” in English but “حیات” is used to describe “life”. This problem can diverse to whole meaning of what writer intend to tell the readers. Multi-sounds letters are like “Z” that is generates by “ض”, “ظ”, “ذ” and also “S” that is generates by “س”, “ص” and “ت”. “T” that is generates by “ط”, “ت”.

Style dimension (meaning is the same): For example the word “Tehran” which refers to the capital city of Iran can be writes like “طنز” , “تهران” but the meaning is the same.

5.5 Different types of word writing forms

Unlike English language which has a unify word writing style, Persian is a language which has many different writing forms where many of them are not according to right to left standards. For example “نام خوابم” or “نام خوابم”, “نام خوابم” or “نام خوابم”, “نام خوابم” or “نام خوابم”. All of them indicates “sleep” concept but with different style. Even writer can note down exact as his speech without any standard style.

5.6 Generation of novel combined words

Persian is a generative language in order many novel words may be made by appending words. So the eventuality of new ones which that can’t be found in the systems lexicon is high[17]. Some imported words of English or Arabic languages are widely used
among Iranian people. For example make SMS call expression is used many times like this: “آسم نزن” which is a combination of two different language words: “SMS” and “نزن” “arsal”. But the second word is used at its informal style. The “نزن” “bezan” implicates “hit” and doesn’t fit with SMS word at all. These type of new combination analysis is hard for system to analyze them in semantic dimension because writer’s implication can’t be recognized at all. Thus the meaning of whole sentence diverse completely. Another popular issues is high summarization of words. For example “call me” expression in English use like: “Z” “Z” in SMS or online Chat many times for writing shortness. System will indicates it as a letter not a sentence at all. Writing Persian words in English sound and pronunciation is considerable. For example okay word will be write like: “واکی” which is not an original Persian word at all.

5.7 Exact implication of equivocal

For example in a section of particular poem: “من با ترانه زندگی می کنم” the word “ترانه” (in English: song) indicates to meaning, first usage for a specific woman name and second usage is for music concept. This similarity increase risk of ambiguity for system to analyze the “ترانه” as a woman name or as a concept. Such of this uncertainty can challenge the system for correct determination. Another example can be like this sentence: “من تهرانی هستم” indicates to meaning. First “I’m originally from Tehran”. Second: “I’m Tehrani” as an introduction expression by a man or woman. In this case being a man or woman hasn’t been mentioned at all, Persian language doesn’t distinct man and woman by particular Pronoun at all.

5.8 Utilizing Collective postfix

Usage of unlimited range of declensional postfix is also named one of main challenge in Persian language. [20] for example it uses a wide variety of postfixes like these sentences “من می خرم” , “تو می خری” and “او می خرد” , “ما می خریم” , “شما می خرید” , “آنها می خرند” which some distinct postfix utilized. [22]

| Persian collective words | In English | Postfix |
|--------------------------|-----------|---------|
| اکتشافات                | Discoveries | ات |
| روحانیون                | Clerics | ون |
| نقشه ها               | Maps | ها |
| محصصین               | Students | بین |
| استادان              | Professors | ان |

5.9 Usage of unofficial idioms

Popularity of informal expression[20] grows much than last decade among Persian speakers around the world. In many case writers use Sarcastic to deliver their purpose.
indirectly. For example "از بس حرف بی منطق شنیدم که نظم کور شد" indicates writers disinterest to speak. An example of using metaphor is "گربه رو دم حجله باید کُشت" indicates we must straight everything first. These types of expression are very difficult for system to analyses them in a correct way.

| unofficial word | Official form | In English |
|-----------------|--------------|------------|
| گورکشکن | کُشت | For |
| گربه رو دم حجله | باید کُشت | Seed |
| نیکا کردن | See | This car |
| میارد | می آورد | Will bring |
| اونجاست | آن هاست | It is there |
| بارونیه | بارانی است | It is raining |

### 5.10 Utilizing of a particular brand name as a verb

Since Google search engine been used among people, they utilizing its brand name as a verb. For example when A ask B about some unknown thing, B will answer him by tells him to google it. In persian people will says "گوگلش کن". These kind of brand usage is popular among Iranian people. In Iran there are some online taxi travel agency which people used a lot in capital city of Iran, Tehran. SNAPP is one of them. When you got time shortage to reach a destination, people will tells you to "اسنپ بگیر" or "اسنپ کن", in English the followed expressions by orders are take snapp and snapp it.

### 5.11 Low amounts of dataset

Unlike English language which has different thousands datasets in various subjects, Persian language is facing low amount of datasets[17] near 1500 labeled documents.[22] Thus process of research and investigation in sentimental analysis will be difficult. Data gathering from the internet by Web crawling techniques will be a good solution to increase number of official Persian data set on the web.

### 6 HAZM Official Persian Language Process Library

HAZM is a Special library for Persian language process which is able to be imported in python. To use this library, all of text must be convert into Unicode. This particular library with help of Deep learning will facilitate Persian language process. Although there are some challenge about HAZM. It doesn’t cover all idioms in Persian language but it can parse the text as well. HAZM doesn’t eliminate extra words and also it doesn’t determine concepts than words. The main attributes of HAZM are: Text cleaning, Sentence and word tokenize, Word lemmatize, POS tagger, Shallow parser, Dependency
parser, Interfaces for Persian corpora, NLTK compatible, Python 2.7, 3.4, 3.5 and 3.6 support.

7 Conclusion

Huge range of data uploads every seconds by Persian internet users around the world describes their opinions and emotion in social networks, web forums, and blogs about different social news, products exchange, politics talks and their hobbies establish an enormous and precious source to investigate on it by researchers and developers. In this paper we tried to gather and assert Sentimental Analysis Challenges in this ancient language which face to them recently. Working on words root can be propose for the future works which is a challenging job. Research on this title can increase accuracy in feature selection and classification. Sentimental analysis methods in Persian language can be implemented by development tools like Hadoop. One of the solution to reduce Search time on lexicon based data structure is implementation on document based NoSql based database like mongoDB. A next exiting feature work can be propose is to initiate sentimental analysis techniques on telegram which is known as one of the most successful social network in Iran[23] in political area. The title contains huge potential to investigate on it. It has multiple strong hidden target among them is eliminating people challenges and problems by find their important ones.

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