Part of Speech Tagging (POST) of a Low-resource Language using another Language

Developing a POS-Tagged Lexicon for Kurdish (Sorani) using a Tagged Persian (Farsi) Corpus

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Abstract

Tagged corpora play a crucial role in a wide range of Natural Language Processing. The Part of Speech Tagging (POST) is essential in developing tagged corpora. It is time-and-effort-consuming and costly, and therefore, it could be more affordable if it is automated. The Kurdish language currently lacks publicly available tagged corpora of proper sizes. Tagging the publicly available Kurdish corpora can leverage the capability of those resources to a higher level than what raw or segmented corpora can provide. Developing POS-tagged lexicons can assist the mentioned task. We use a tagged corpus (Bijankhan corpus) in Persian (Farsi) as a close language to Kurdish to develop a POS-tagged lexicon. This paper presents the approach of leveraging the resource of a close language to Kurdish to enrich its resources. A partial dataset of the results is publicly available for non-commercial use under CC BY-NC-SA 4.0 license at https://kurdishblark.github.io/. We plan to make the whole tagged corpus available after further investigation on the outcome. The dataset can help in developing POS-tagged lexicons for other Kurdish dialects and automated Kurdish corpora tagging.

1 Introduction

The Kurdish language has received more attention since Hassani (2018) reported the status of resource availability for the language. However, the language requires much more effort and attention to gain a position that could be called “computable” (Hassani, 2018). As for other languages, one of the most costly areas of resources development for Kurdish processing is the preparation of tagged-corpora. The Part of Speech Tagging (POST) is essentially a manual, time-consuming, and human-resource demanding task (Ahuíso et al., 2003; Tsai and Chen, 2004). Various Natural Language Processing (NLP) tasks such as Machine Translation (MT), Named Entity Recognition (NER), and Information Retrieval (IR) use POST (Araujo, 2002). Therefore, those tasks can benefit from automating POST even if the automation is partial. Furthermore, in multi-dialect languages such as Kurdish, having resources in one dialect can be used to develop and expand the resources for the other dialects of the language.

This paper presents the attempt to leverage the resources of a close language to Kurdish to enrich its resources. Using resources from a close language to POS tag another has been reported in the literature (Hana et al., 2006; Khan et al., 2011; Scherrer and Sagot, 2013; Vergez-Couret, 2013; Hamdi et al., 2015; Turk Khemakhem et al., 2016; Magistry et al., 2019; Eskander et al., 2020) in which different solutions have been proposed. We use Bijankhan (Oroumchian et al., 2006) corpus in Persian (Farsi) as a close language to Kurdish to develop a POS-tagged lexicon.

The rest of this paper is organized as follows. Section 2 reviews the related work. In Section 3, we present the method that we follow to compute the linguistic distance. We report the results in Section 4. Finally, Section 5 concludes the paper and suggests some areas for future work.
2 Related Work

The Kurdish POS tagged resources are scarce despite the efforts to improve its status by various scholars active in Kurdish processing to initiate projects. In this section, we address Kurdish POS tagging work.

Matras, Yaron et al. (2016) tagged the transcribed data of the collected speech data set from different Kurdish-speaking regions. The annotation alongside a search utility allows researchers to retrieve the data from various phonological and morphological perspectives.

A team of scholars at the University of Kurdistan in Sanandaj developed a corpus for Kurdish (Sorani) (University of Kurdistan, 2019). According to the project website (University of Kurdistan, 2019), the team has tagged a part of the corpus so far. The website offers a search facility to allow users to search the corpus based on the tags or specific words.

Similarly, about 22% AsoSoft-Corpus (AsoSoft, 2019)) for Sorani is annotated according to six categories (Veisi et al., 2019). The developers have normalized the text and used the Text Encoding Initiative (TEI) XML format to present the data.

KSLexicon (Mohammad Amini et al., 2015) includes 35,000 Sorani entries that have been tagged based on 28 part-of-speech tags. The developers state that the data has been extracted from an electronic Kurdish-Persian dictionary.

Walther and Sagot (2010) suggested a method for developing a lexicon for less-resourced languages and applied it to Sorani. Their morphological lexicon, SoraLex, is publically available.

One of the earliest work on Kurdish POST is a “pre-annotation tool for developing a POS-annotated corpus”, for Kurmanji that its developers called it KurLex (Walther et al., 2010).

The literature has many resources that address the usage of resourceful languages in POS-tagging under-resourced languages (Hana et al., 2006; Khan et al., 2011; Scherrer and Sagot, 2013; Vergez-Couret, 2013; Hamdi et al., 2015; Turki Khemakhem et al., 2016; Magistry et al., 2019; Eskander et al., 2020). The related work have applied different approaches and methods in leveraging a resourceful language in favor of a low-resourced one. Some of those approaches have been used in POS-tagging of Kurdish in the research that we mentioned above.

However, the literature shows that the preparation of POS-tagged lexicon and POS-tagged corpora for Kurdish remains one of the high-priority and challenging tasks in Kurdish processing. The automation of the process could help in developing more resources in a shorter period. Although traditional POS-tagging might produce more accurate outcomes, it takes a much longer time and requires more costly efforts. Therefore, the automation approaches to Kurdish POS tagging should be intensified along with the continuation of the manual efforts.

3 Method

We use a combination of manual and automated processes to prepare a POS-tagged lexicon from a close language to Kurdish. We translate Bijankahn POS-tagged to Kurdish (Sorani). We manually check the translated entries by labeling them as “correct” for the entries translated correctly, “not-correct” for the wrong translations, and “not-sure” for those that we are not certain about the correctness of their translation. We then organize the result into three lists according to the mentioned labels.

In this paper, we focus on the correct list and leave the rest for future work. We manually process the correct list further to check the accuracy and the relevance of the tags for the translated lexicon. If we can increase the accuracy through trivial changes, we apply the necessary revisions, or we label them as “concerned” otherwise. The final list includes the entries that are correct from both translation and POS-tagging perspectives.

We use Microsoft Bing for the machine translation. We also use a combination of Libreoffice calc and python scripts for other automated or semi-automated processes. Figure 1 illustrates the flow of the process.

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1Soralex is available at https://gforge.inria.fr/frs/?group_id=482
2To expedite the task, we also use https://www.stars21.com/translator/persian/kurdish/
Figure 1: The process flow of the applied method
Table 1: The input/output datasets to/from the processes

| Process                          | Input dataset       | Number of Entries | Output dataset      | Number of Entries |
|----------------------------------|---------------------|-------------------|---------------------|-------------------|
| Remove duplicates                | Collection UNI.txt  | 2,597,937         | Duplicates-removed.txt | 84,467            |
| Convert to CSV                   | Duplicates-removed.txt | 84,467           | Duplicates-removed.csv | 84,467            |
| Machine translation              | Duplicates-removed.csv | 84,467          | Translated.csv      | 84,467            |
| Evaluate the translated output   | Duplicates-removed.csv | 84,467          | Correct             | 20,059 \(^a\)    |
|                                  |                     |                   | Not-correct          | 55,684             |
|                                  |                     |                   | Undecided            | 8,700              |
|                                  |                     |                   | AR-tagged            | 1,845              |
| Evaluate the accuracy of tagging | Correct dataset     | 20,059            | Accurate             | 13,294             |
|                                  |                     |                   | Repeated \(^b\)     | 6,494              |
|                                  |                     |                   | Concerned            | 271                |

\(^a\) The list had 20,083 entries. Further processes found 14 repeated Farsi entries.
\(^b\) Repeated Kurdish entries.

4 Result

Applying the method described in Section 3, we obtained several datasets that are shown in Table 1.

During the manual process, we applied trivial changes such as removing avoidable ‘Á’ and ‘ñ’ at the beginning or end of some vocabularies. Furthermore, the duplicates that couldn’t be identified automatically were also removed.

Table 2 shows the number, percentage, and percentile of each POST in the resulted lexicon. As the data shows the highest number belongs to the singular nouns (N_SING) with 6,998 entries (about 52% of the lexicon) and the smallest number belongs to Oh nouns (OHH) with 1 entry.

Figure 2 illustrates the magnitude POS tags in the result.

Figure 3 presents the POS tags’ percentile in the result.

The obtained lexicon is considerably smaller than the original Farsi one. However, future work on the remaining lexicon can improve the results. That is because proper translation can eliminate the manual POS-tagging task that is the most costly activity in the preparation of the POS-tagged lexicon. The current list is also important because it allows us to use the more detailed tagset that the Bijankhan corpus suggests.
Table 2: The number, percentage, and percentile of each POST in the resulted lexicon.

| POS  | Lexicon No | %     | Percentile |
|------|------------|-------|------------|
| ADJ  | 4          | 0.0003| 0.1        |
| ADJ_CMPR | 133      | 0.0099| 0.8        |
| ADJ_INO | 52        | 0.0039| 0.6        |
| ADJ_ORD | 21        | 0.0016| 0.4        |
| ADJ_SIM | 2181      | 0.1629| 0.9        |
| ADJ_SUP | 153       | 0.0114| 0.8        |
| ADV  | 23         | 0.0017| 0.4        |
| ADV_EXM | 8         | 0.0006| 0.2        |
| ADV_I | 11         | 0.0008| 0.3        |
| ADV_NEGG | 8         | 0.0006| 0.2        |
| ADV_NI | 314        | 0.0235| 0.9        |
| ADV_TIME | 58       | 0.0043| 0.7        |
| CON  | 119        | 0.0089| 0.7        |
| DEFAULT | 5         | 0.0004| 0.2        |
| DELM | 75         | 0.0056| 0.7        |
| DET  | 14         | 0.0010| 0.3        |
| IF   | 4          | 0.0003| 0.1        |
| INT  | 4          | 0.0003| 0.1        |
| MORP | 25         | 0.0019| 0.4        |
| MQUA | 3          | 0.0002| 0.08       |
| N_PL | 2147       | 0.1604| 0.9        |
| N_SING | 6998     | 0.5228| 1          |
| NP   | 6          | 0.0004| 0.2        |
| OH   | 2          | 0.0001| 0.05       |
| OHH  | 1          | 0.0001| 0.03       |
| P    | 50         | 0.0037| 0.6        |
| PP   | 27         | 0.0020| 0.5        |
| PRO  | 44         | 0.0033| 0.6        |
| PS   | 15         | 0.0011| 0.3        |
| QUA  | 29         | 0.0022| 0.5        |
| SPEC | 34         | 0.0025| 0.5        |
| V_AUX | 22        | 0.0016| 0.4        |
| V_IMP | 48         | 0.0036| 0.6        |
| V_PA | 274        | 0.0205| 0.9        |
| V_PRE | 209       | 0.0156| 0.8        |
| V_PRS | 165       | 0.0123| 0.8        |
| V_SUB | 99         | 0.0074| 0.7        |
5 Conclusion

This paper provides the process and the result of obtaining a Kurdish (Sorani) POS-tagged lexicon from a POS-tagged corpus in Farsi (Persian) through combining machine translation, automated duplication removal, and manual evaluation of the results. Through the mentioned process we obtained a POS-tagged lexicon of 13,294 entries for Kurdish (Sorani). The lexicon can be used as a seed for further development that can be expanded to other Kurdish dialects. It is also important as has been tagged using a considerably wider tagset that can help in tagging Kurdish corpora more precisely.

In the future, we would like to expand the lexicon ot other Kurdish dialects, apply it as a seed to expand its volume using synonyms, and using it to tag available Kurdish corpora.

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