

The CLE Urdu POS Tagset

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Abstract

The paper presents a design schema and details of a new Urdu POS tagset. This tagset is designed due to challenges encountered in working with existing tagsets for Urdu. It uses tags that judiciously incorporate information about special morpho-syntactic categories found in Urdu. With respect to the overall naming schema and the basic divisions, the tagset draws on the Penn Treebank and a Common Tagset for Indian Languages. The resulting CLE Urdu POS Tagset consists of 12 major categories with subdivisions, resulting in 32 tags. The tagset has been used to tag 100k words of the CLE Urdu Digest Corpus, giving a tagging accuracy of 96.8%.

Keywords: POS Tagset, Urdu, Corpus

1. Introduction

Choosing an appropriate tagset is a preliminary and vital task for successful POS tagging. A tagset needs to be able to encode the grammatical distinctions that are of interest for further steps in natural processing or for linguistic research, while allowing for efficient and accurate automatic tagging (MacKinlay, 2005). With respect to the South Asian language Urdu (spoken mainly in Pakistan and India), several different POS tagsets have already been developed. However, in the process of POS tagging the CLE Urdu Digest corpus, the only large generally available corpus for Urdu,¹ we identified several shortcomings with the existing POS tagsets and came to the conclusion that a new revised tagset needed to be designed to: (a) provide access to the kinds of linguistic distinctions we found necessary for further natural language processing such as grammar development, machine translation and generation; (b) improve the automatic tagging.

This paper discusses the existing tagsets for Urdu (Muaz, Ali & Hussain, 2009; Sajjad, 2007; Sajjad & Schmid, 2009; Schmid, 1995) and presents a new POS tagset that has been used to tag the CLE Urdu Digest Corpus.

2. Literature Review

POS tagsets have been reviewed and revised for a variety of languages due to a variety of motivations. Lüdeling & Kytö (2008) provides a detailed comparison of a range of English POS tagsets (including tagsets for the Brown, LOB, UPENN, BNC-C5, BNC-C6, ICE, PoW and LLe corpora) along with their differences. Lüdeling reports that these tagsets differ in accordance to the requirement of the target application of the tagged corpus as well as according to the underlying linguistic theory. For example, the ICE tagging scheme differs from other tagsets mainly due to the fact that it was developed at the time when syntactic theories like Generalized Phrase Structure Grammar and Lexical-Functional Grammar had proposed the notion that a category is composed of a

bundle of features. Therefore, this tagging scheme was more useful for feature-based parsers.

It is not uncommon to experiment with different tagset designs and to repeatedly revise an existing tagset in order to capture typological properties in a more linguistically adequate and computationally efficient manner. Some examples come from work on Vietnamese (Tran et al., 2009), Slovene (Dzeroski, Erjavec & Zavrel, 2000), Swedish (Carlberger & Kann, 1999) and Persian (Oroumchian et al., 2006).

2.1 South Asian POS tagsets

With respect to South Asian languages, several different tagsets have been designed. These differ in terms of morpho-syntactic features, tag definition and tag granularity. However, South Asian languages form a common linguistic area and therefore share many structural characteristics. This realization is reflected in Baskaran et al. (2008), which contains a proposal for a framework that defines an overall common POS tagset for the languages of India (see also Chandrashekar (2007) on Sanskrit). The framework follows certain principles, i.e., a tagset should be hierarchically organized and include reference to morpho-syntactic features. Further, a balanced approach should be followed in using the form vs. function as criteria for the classification of tags. This framework ensures that common categories across Indian languages are annotated in the same way.

2.2 Urdu POS tagsets

The search for a good Urdu POS tagset has already gone through multiple iterations. In 2003, Hardie designed the first POS tagset for Urdu. He followed the EAGLES guidelines (Hardie, 2003). This tagset was based on morpho-syntactic categories of Urdu and contained 350 tags. As a large number of tags is difficult to handle for computational processing (with a small-sized corpus), there has been limited follow up work based on this tagset, beyond the initial POS tagger through the EMILLE project (Lüdeling & Kytö, 2008).

Sajjad (2007) & Sajjad & Schmid (2009) designed a

¹ See <http://www.cle.org.pk/clestore/>.

(4) mErI apnI gHaRI
 PRS APNA NN
 my own watch
 ‘my own watch’

There are two separate subcategories for relative pronouns: Relative Personal (PRR) and Relative Demonstrative (PRD). The syntactic behaviour of these pronouns is different from personal pronouns and demonstrative. The following example demonstrates the relative personal (PRR) *jo* ‘who’.

(5) vuh laRkI jo AI
 PRP NN PRR VB
 3Sg girl who come.Perf.F.Sg
 ‘The girl who came.’

It was discussed whether we should create separate categories for interrogative pronouns. We found that the interrogative pronoun can replace other related POS tags e.g. pronoun, adverb and quantifier etc. Hence no special tag for interrogative pronouns is created, and the interrogative words are merged into the relevant POS category. For example, *kon* ‘who’ is personal pronoun (PRP) and *kitnA* ‘how much’ is quantifier (Q).

3.3 Verb

Urdu verbs can be differentiated into canonical main verbs (6) light verbs appearing with a noun or adjective (7), and copular verbs (8).

(6) vuh AI
 PRP VB
 3Sg come.Perf.F.Sg
 ‘She came.’ (canonical main verb)

(7) usE [yAd AI]
 PRP NN VB
 3Sg memory come.Perf.F.Sg
 ‘He/She remembered.’ (noun + light verb)

(8) vuh xuS he
 PRP JJ VB
 3Sg happy be.Pres.3.M.Sg
 ‘He/She is happy.’ (copula verb)

We followed the decision of Muaz, Ali & Hussain (2009) and Bharati et al. (2006) and did not create a separate tag for these categories because all of these verbs show a similar syntactic behavior. However, we differ with the decision of Muaz, Ali & Hussain (2009) in which the copula ‘be’ is merged with the tense auxiliary simply because both have the same surface form (cf. (8) vs. (9)).

(9) vuh ghar AI he
 PRP NN VB AUXT
 3Sg home come be.Pres.3.M.Sg
 ‘She came home.’

In (9), *he* comes after the main verb and expresses tense information, hence it is a tense auxiliary. However, in (8) it is functioning as a main verb. For this reason, it is tagged as VB.

There are different morphological forms of Urdu verbs. The root *A* ‘come’ has the morphological forms *A-tE* (imperfective masculine plural), *A-tI* (imperfective feminine singular), *A-ON* (subjunctive first person singular) etc. Unlike Hardie (2003) and following Muaz, Ali & Hussain (2009) and Bharati et al. (2006), we do not create separate tags to encode morphological information. There is a single tag VB for all forms of Urdu main verbs.

However, there is an exception to this rule. The verb in the infinitive form is tagged as VBI. We provide a special tag for verbal infinitives because these act as verbal nouns and therefore display a syntactic distribution that differs from that of main verbs. We have also found that we would have liked to have been able to conduct a targeted extraction of instances of verbal infinitives in our previous work within Urdu NLP. This has not been possible with existing tagsets.

(10) sigrET pInA burA he
 NN VBI JJ VB
 cigarette drink.Inf.M.Sg bad be.Pres
 ‘Smoking cigarettes is bad.’

3.4 Auxiliary

The tagset encodes the fine distinctions necessary for the complex nature the verbal complex in Urdu. There are 4 types of auxiliaries; Aspectual (AUXA), Progressive (AUXP), Tense (AUXT) and Modals (AUXM). An example of a tense auxiliary (AUXT) is given in (9). The examples of the other tags are as follows:

(11) vuh ghar A rahI he
 PRP NN VB AUXP AUXT
 3Sg home come prog be.Pres
 ‘She is coming home.’

(12) vuh ghar A saktI he
 PRP NN VB AUXM AUXT
 3Sg home come can be.Pres
 ‘She can come home.’

(13) vuh ghar A gaI
 PRP NN VB AUXA
 3Sg home come completion
 ‘She came home.’

(14) kitAb paRhI gaI
 PRP VB AUXA
 3Sg read.Perf.F.Sg passive
 ‘A/the book was read.’

3.5 Nominal Modifiers

Nominal modifiers convey information about a noun. This include adjectives (JJ) e.g. *accHA* ‘good’, quantifiers (Q) e.g. *kuch* ‘some’, cardinal (CD) e.g. *do* ‘two’, ordinal (OD) e.g. *dUsrA* ‘second’, fraction (FR) e.g. *AdHA* ‘half’ and multiplicative (QM) e.g. *gunA* ‘times’.

We found that there are many adjectives that also appear as a noun. We decided to assign the POS according to the syntactical function. For example, *GulAm* ‘slave’ appears as an adjective in (15) and as a noun in (16).

- (15) GulAm mulk
 JJ NN
 slave country
 ‘slave country’
- (16) GulAm AyA
 N VB
 slave come.Perf.M.Sg
 ‘The slave come.’

As discussed in section 3.1, we consider multiwords as a single token. The superlative and comparative forms of some borrowed adjectives have Persian suffixes *tarIn* and *tar* respectively. A space occurs between the adjective and the suffix e.g. “*AzIm tar*” ‘greater’ and “*sust tarIn*” ‘slowest’. We consider these as multiwords and assign the tag JJ.

3.6 Adverb

There are two sub-categories of adverbs: general adverb (RB) and negation (NEG). The adverbs expressing negative e.g. *nahIn*, *na*, *mat* are tagged as NEG. The negatives have a different (more restricted) syntactic distribution than other adverbs and have therefore received a special tag. Other adverbs e.g. manner adverbs are tagged as RB. The examples are given below.

- (17) vuh AhistA call
 PRP RB VB
 3Sg home walk.Perf.3.F.Sg
 ‘She walked slowly.’
- (18) vuh nahIn AI
 PRP NEG VB
 3Sg not come.Perf.3.F.Sg
 ‘She did not come.’

We discussed in section 3.5 that spatial and temporal adverbials e.g. *andar* ‘inside’, *ab* ‘now’, *kal* ‘tomorrow’ are tagged as common noun (NN) because of their syntactic behavior.

3.7 Adposition

There are two subcategories of adpositions: re- and postpositions. Some examples of Urdu prepositions are: *fi* ‘in’/‘per’, *az* ‘from’, *sivAE* ‘except’ and *bajuz* ‘except’ etc. (Raza, 2011). An example with *fi* (borrowed from Arabic) is given below.

- (19) 50 rupe [fi kilogram]
 CD NN PRE NN
 50 rupees per kilogram
 ‘50 rupees per kilogram’

Examples of postpositions are *nE* (the ergative marker), *kO* (the accusative and dative), *tak* ‘till’, *liE* ‘for’ and *bin* ‘without’. As discussed in section 3.1, we consider adverbial nominals e.g. *andar* ‘inside’, *Upar* ‘above’/‘over’ etc. as common nouns.

3.8 Conjunction

The category conjunction is divided into the usual coordinate and subordinate conjunction, but also provides for two Urdu specific categories.

The examples of co-ordinating conjunction (CC) are *or* ‘and’ and *Iekin* ‘but’/‘however’ etc. The examples of sub-ordinating conjunctions (SC) are *kiyUnkah* ‘because’ and *tO* ‘then’ etc. An example of a SC is given below.

- (20) agar mahnat karO gE
 SCP NN VB AUXT
 If hard-work do.Sub. future
- to kAmyAb ho gE
 SC JJ VB AUXT
 then successful be future
 ‘if (you) will work hard then (you) will be successful.’

The above example have *agar* ‘if’ as pre-sentential (SCP). These words appear before the first clause in subordinating constructions.

Following Bharati et al. (2006), we introduced the tag subordinating-conjunction-*kar* (SCK) for the verb *kar*(/kE) ‘do’ appearing at the the end of embedded non-finite clauses. An example of this construction is given below.

- (21) vuh [ghar bEc kar] AI
 PRP NN VB SCK VB
 3SG house sell do come.Perf
 ‘She came after selling the house.’

3.9 Interjection

The interjection (INJ) normally occurs at the start of the sentence. It is kept as a separate category in the tagset. Some examples are *vAh* ‘bravo’/‘well done’, *arE* ‘O’/‘hey’ and *subh2An Allah* ‘glory to Allah’ etc. It is important to note that the multiword *subh2An Allah* gets a single tag INJ.

3.10 Particle

Particles are divided into two subcategories: a general particle tag (PRT) and a VALA tag for a language specific category (‘the X one’).

The general particle tag (PRT) includes emphatic particles e.g. *bHI* ‘also’ and *hI* ‘even’.

- (22) [vuh bHI] AE gI
 PRP PRT VB AUXT
 3SG too come.Perf future
 ‘She too will come.’

The usages of the particle *val-* are described in detail in Muaz & Khan (2009). An example of is given below.

- (23) sabZI valA
 NN VALA
 vegetable one
 ‘The thing (e.g. meal) that has vegetables’/
 ‘the person who sells vegetable.’

3.11 Symbol

Symbol has two categories: Punctuation (PU) and other symbols (SYM).

3.12 Residual

Residual contains one tag for Foreign Fragment (FF) covering all foreign language elements. This tag is assigned only in that situation when we cannot assign an Urdu POS tag to that word (or multiword). For example, *subh2An Allah* 'glory to Allah' is an Arabic fragment, but we assign the interjection tag (INJ) to it. Similarly, the English noun *book* in the following example is treated as noun because it has been absorbed into standard Urdu usage via intensive language contact with English.

(24) us nE buk paRHI
 PRP PSP NN VB
 3Sg Erg book read.Perf.F.Sg
 'He/She read the book.

If we cannot assign an Urdu POS tag to a foreign fragment, then we consider it as a foreign fragment (FF).

4. Tagging the CLE Urdu Digest Corpus

The updated tagset was used to tag the CLE Urdu Digest Corpus, covering an 80% training corpus and a 20% testing corpus. The files were selected randomly. The Tree Tagger (Schmid, 1994; Schmid, 1995) was used for automatic tagging, with a machine learning technique of Decision Trees and smoothing technique of Class Equivalence. The results are given in table 1. It shows a tagging accuracy of 96.8%, indicating that our tagset is performing well.

5. Discussion and Conclusion

In analyzing the results of the tagger, it was observed that the tagger encounters problems in disambiguating between some particular pairs of tags.

While there are two tags for nouns (noun vs. proper noun), Urdu does not make a clear distributional distinction between these nouns. We have decided to nevertheless keep both tags since information about proper nouns is generally important for further natural language processing.

Nouns are confused with adjectives when they occur adjacent to one another. The same issue was found by Muaz, Ali & Hussain (2009).

Due to the fact that the postposition 'in' and the personal pronoun 'I' are written the same in Urdu (میں), the tagger confuses the two when they occur in syntactic positions where both options are possible. Similarly, the tagger finds the Urdu word ؤ 'to' confusing, as it can act both as a discourse particle and as introducing a subordinate clause.

On the other hand, the results of the newly added tag Foreign Fragment (FF) has shown a good accuracy as compared to the previous tagsets where this category was dealt with under expressions (Exp) (Sajjad, 2007, Sajjad & Schmid, 2009) or was ignored (Muaz, Ali & Hussain, 2009).

In conclusion, we have presented a new POS tagset for Urdu. It is based on a critical analysis of several previous

iterations of tagset proposals and builds on these. The new CLE Urdu POS Tagset has been used to tag 100k words of the publically available balanced CLE Urdu Digest corpus. Work is continuing to extend the tagged corpus to 1 million words.

| Tag | Total Tokens | Error | Error % | Maximum Misclassification | |
|------|--------------|-------|---------|---------------------------|---------|
| VBF | 2602 | 119 | 4.57 | 30 | AUXT/NN |
| AUXA | 760 | 102 | 13.42 | 98 | VBF |
| PDM | 428 | 77 | 17.99 | 69 | PRP |
| PRP | 1091 | 72 | 6.60 | 53 | PDM |
| NN | 6266 | 65 | 1.04 | 11 | JJ |
| JJ | 1820 | 54 | 2.97 | 30 | NN |
| PSP | 3844 | 53 | 1.38 | 30 | PRP |
| SC | 454 | 52 | 11.45 | 35 | PRT |
| AUXT | 704 | 43 | 6.11 | 28 | AUXA |
| NNP | 1014 | 40 | 3.94 | 37 | NN |
| Q | 291 | 20 | 6.87 | 15 | NN |
| RB | 462 | 19 | 4.11 | 9 | NN |
| CC | 502 | 17 | 3.39 | 6 | NN |
| PRR | 139 | 14 | 10.07 | 5 | PRP |
| PRT | 395 | 13 | 3.29 | 9 | PSP |
| AUXP | 121 | 9 | 7.44 | 7 | VBF |
| PRS | 115 | 7 | 6.09 | 6 | PDM |
| AUXM | 104 | 6 | 5.77 | 5 | AUXA |
| INJ | 17 | 6 | 35.29 | 6 | NN |
| SCK | 154 | 6 | 3.90 | 3 | RB |
| SCP | 65 | 6 | 9.23 | 5 | SC |
| CD | 622 | 4 | 0.64 | 2 | PU |
| PU | 2536 | 4 | 0.16 | 2 | VBF |
| VBI | 438 | 4 | 0.91 | 2 | VBF |
| FF | 72 | 3 | 4.17 | 3 | PU |
| OD | 150 | 3 | 2.00 | 2 | CD |
| PRF | 14 | 2 | 14.29 | 2 | NN |

Table 1: Results and Error Analysis

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⁵ See <http://cle.org.pk/eulr/>.

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