

Parts of Speech Tagging of Romanized Sindhi Text by applying Rule Based Model

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Summary

Role of natural language processing (NLP) in machine learning is very important and its task's such as Parts-of-Speech (POS) tagging, tokenization of (words, sentences, paragraph) etc. Parts-of-speech tagging performed as a pre-processing steps in natural language processing, such as syntactic parsing, information extraction (IE) and machine translation (MT). The Romanized Sindhi lexicon for computational processing is not available. In this research work of POS tagging of Romanized Sindhi text based on online Python tool were used and performed the task of POS tagging. By applying rule based model for analyzing the text and extract the text from given input text. POS Tagging algorithms were also designed for implementation of Romanized Sindhi Text (RST). Construction of RST data of 100 sentences and these sentences are depends on the (Noun-Verb-Determinant) for POS tagging and have important task towards computational RST processing. The rule based model was used for the POS tagging of RST and it worked in easiest way generate appropriate results of RST. This result will promote the need for further research to perform different task in different domain.

Key words:

Natural language processing (NLP), Parts-of-speech (POS), Romanized Sindhi Text (RST), Algorithm, Python.

1. Introduction

Natural language processing is the basic area of machine learning and artificial intelligence, it has important role of linguistic in communication and interaction. Also, NLP plays important role in the field of the Human Computer Interaction (HCI). Various issues came during the processing of natural languages and these are understanding language, computer is enabling to derive appropriate meaning from natural-language. Parts of speech is one of the most important task of natural language processing by using rule based approach for the assigning of a tag on word, shows semantic meaning of word.

Parts-of-Speech tagging (POS) is used for the understanding of the text and assigned a tag. Mostly Noun, verb, Pronoun and determinants tags are used for the POS tagging [1, 6]. For the POS tagging of text various

techniques are used but Support Vector Machine (SVM), Rule Based, Stochastic Tagging, Transformation-Based Tagging and Hidden Markov Model etc [1-7].

The POS tagger is categorized as supervised and unsupervised by applying different models can be rule based model and statistic models. Rule based approach mostly used in parts of speech tagging this approach uses as manually to construct rules for text to identify appropriate tag when one word assign multiple tag [3]. POS tagging of Swedish language used Hidden Markov model (HMM) and Transformation based learning (TBL). Measure of tag set, accuracy of POS tagging, unknown error rate of tokens and accuracy also calculated by known error [4].

Now-a-day's natural language process supported on automated application for understanding the ideas from text. A new rule based model also analyzes the rules of natural language and extract information easily [5]. Tagging of the text process either online by using language rules to extract correct tag when text process on system. Words tag also describe the words in a single sentence (in sentence include multiple parts-of-speech and punctuation) which are: Noun (N), Pronoun(P), Verb(V), Adjective (A), Adverb (A), Preposition (P), Conjunction (C), Interjection (I) some-times refers to determiners (D). Tag set also construct by applying through the language rules [6]. Rule Based model also applied in Hindi Language contains data set twenty six thousand one hundred forty nine words for POS tagging. Results also evaluate on system with different area of language where Hindi language used which area are: News (N), Essays (E), Short Stories (SS) and measure the accuracy of system is 87.55% [7].

Sindhi language is one of the oldest languages of the world and it needs more attentions of the researches for issues and challenges came during NLP testing of Romanized Sindhi [8]. Various NLP tool used for the handwritten work [9, 10] and other text and it depends upon the grammatical structures [11].

By rapidly increase in latest technologies of computer and mobile applications, used for different languages for the communication purposes. Use of Sindhi language increased as technology growing fast. Sindhi script is

difficult in writing as compared to other languages, so for the providing easiness to the users to develop the Romanized Sindhi. In this research work studied the Parts-of-Speech tagging on the Romanized Sindhi text by applying Rule based model.

2. System of POS Tagging Study

In this study of POS tagging system is based on the four parts, such as Input data, Break into the text, Match and Rule Based model as described in Figure 1. After the input data of Romanized Sindhi text into the online tool (based on the Python <http://text-processing.com/demo/tag>) and it processed and Break into words. Match of the tag in to two parts one is Assign tag and second is incorrect tag. For the incorrect tag Rule Based model is used for the further process. Rule based model is the algorithm used for the POS tagging to identify the Romanized Sindhi text as defined in Table1. Following Rules (1-10) are applied to POS tag to assign the proper tag and get appropriate results.

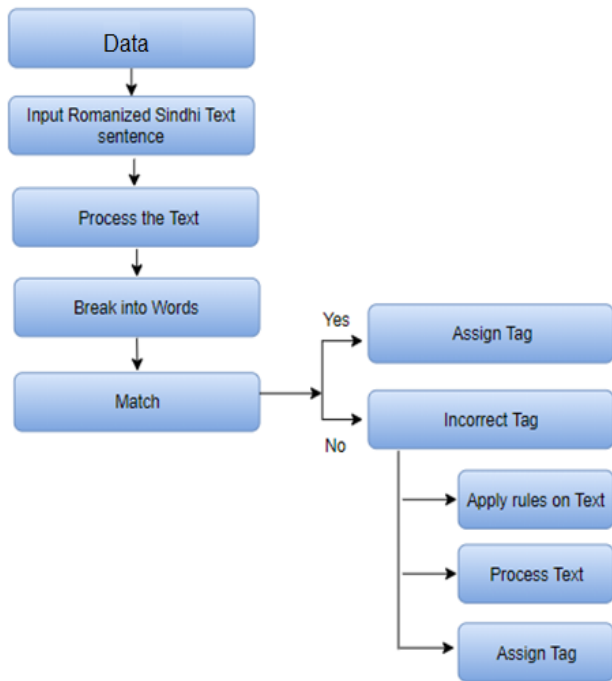


Fig. 1 System of POS Tagging of Romanized Sindhi Text

Table 1: Algorithm of POS Tagging

Parts of Speech Tagging Algorithm of Romanized Sindhi Text	
S.N O	Steps of Algorithms
1	Take input of Romanized Sindhi Text
2	Repeat steps 3 to 7 when get appropriate output
3	Break the Romanized Sindhi Text into words
4	If word is matched than assign a tag of each word
5	If same tag assign multiple words than make rules for words assign one tag of one word
6	If than one tag of each word than tagger tagged the word by assigning rules for new word
7	If one tag assign with one word then display the word with tag
8	Else select one or more rules of linguistic, by applying on words for extract word with appropriate tag
9	Show the words with tag as an output
10	Put new rules for new words when entered

Rule 1: Sentence structure should be built by applying formula of SVO (Subject +Verb +Object)

Example: You are doctor
 ↓ ↓ ↓
 Subject Verb Object
 ↓ ↓ ↓
 Tou ahen doctor

Rule 2: Prefix of the following (Ma, Mounkhe, Huwa, Manhon, Na, Wanu sijh, cha, eho, kethe, Ali , Sara etc) in sentences as starting words, it is refers to noun class.

Example: I am a Student → Ma/NNP ahyan/VBD shagrid/JJ → مان آهيان شاگرد

Rule 3: Prefix of the following (he) in sentences as starting words, it is refers to pronoun class.

Example:He is intelligent He/PRP ahy/VBD hoshar/NN → هي آهي هوشيار

Rule 4: Prefix of the following (Ma, Mounkhe, Huwa, Manhon, Na, Wanu sijh, cha, eho, kethe, Ali , Sara, he etc) in sentences as starting words, it is refers to noun as well as pronoun class.

Example: I play game → Ma/NNP khedan/VBD rand/NN → مان کيڏان راند

Rule 5: Infixes the following (Sadyo, Parhyo, maryo, likhyo, budho, khedan etc) those words come in the middle of sentences is known as verb class.

Example: I wrote article → Ma/ NNP likhyo/VBD
article/NN → مان لکيو آرٽيڪل

Rule 6: Infixes the following letters (a, d, e, o) if it comes in the middle of the words in sentences refers to verb class.

Example: I am happy → Ma/NNP ahyan/VBD kush/JJ
→ مان آهيان خوش

Rule 7: Postfixes the following letters (e, o, n, i,u) if it comes in the middle of the words in a sentence refers to verb class.

Example: I learn Sindhi → Ma/NNP sikhani/VBD thi/NN
Sindhi/NNP → مان سکڻ ٿي سنڌي

Rule 8: Postfixes the following letters (d,e, h, o, y) if it comes in the end of the last words in a sentence refers to noun class.

Example: You are teacher → Tou/NNP ahen/VBD
ustad/NN → تون آهين استاد

Rule 9: Parts of speech not identify when sentence is interrogative.

Example: Do i like banana? → Kayan/NN thi/NN
ma/NN pasand kela/NN? → ڪيئن ٿي مان پسند ڪيلا

Rule 10: Parts of speech perform on negative in some cases just like (not mention the subject in the sentence) otherwise not identify.

Example:
Do not forget → Na/NNP wesaryo/VBD → نه وساريو
Negative Verb

3. Experimental Results

The Parts-of-speech tagging was tested on three hundred fifty two words. The results show that the tagger successfully tagged 309 words and 43 words and do not assign correct tag when the text was processed. In Figure 2 results of the input text to the Python by using default POS tagger of Python. Experimental results of the Romanized Sindhi text sentences are given in columns 5 (POS tagging) of Table 2. All the original English, Sindhi and Romanized

Sindhi sentences are given in column 3, column 4 and column 5 of Table 2.

Sijh / NNP ahe / VRB garm/ NN

Fig. 2 Tagged of Romanized Sindhi Text (Python)

4. Conclusion

This research work based on the Rule based model for POS tagging of Romanized Sindhi text. Build the corpus of Romanized Sindhi based on three hundred fifty two (352) words and hundred (100) sentences were tested on python for the study of POS tagging. Successfully achieved the results of Romanized Sindhi parts of speech tagging are three hundred nine (309) words with tag. The POS tagger contains two steps first is the input text and the second is break the text into words and assign tags of each word.

Future Work

Future work will focus on increase the data set for different domain to identify tagger of Romanized Sindhi text. This research work will be very helpful for the new researcher for the solution of problems comes in communications, writing of official letters and analyzing of Romanized Sindhi text for different purposes.

Table 2: Experimental Results of Romanized POS Tagging

S. No	English sentence	Sindhi sentence	Romanized Sindhi sentence	POS Tagging
1	You are doctor	تون اهي ڊاڪٽر	Tou ahen doctor	Tou/NNP ahen/VBD doctor/NN
2	I am student	مان اهيان شاگرد	Ma ahyan shagrid	Ma/NNP ahyan/VBD shagrid/JJ
3	I play game	مان کيڏان راند	Ma khedan rand	Ma/NNP khedan/VBD rand/NN
4	I drink water	مان پيان پاڻي	Ma piyan pani	Ma/NNP piyan/VBD pani/NN
5	Ali killed snake	علي ماريو نانگ	Ali maryo nang	Ali/NNP maryo/VBD nang/NN
6	Doctor call the patient	ڊاڪٽر سڏيو مريض کي	Doctor sadyo mariz khe	Doctor/NNP sadyo/VBD mariz/NN khe/NN
7	I write letter	مان لکيو خط	Ma likhyo khat	Ma/NNP likhyo/VBD khat/WP
8	I read book	مان پڙهيو ڪتاب	Ma parhyo kitab	Ma/NNP parhyo/VBD kitab/NN
9	You fire the home	تو ساڙيو گهر	Tou sadyo ghar	Tou/NNP sadyo/VBD ghar/NN
10	I do work	مان ڪيو ڪم	Ma kayo kam	Ma/NNP kayo/VBD kam/NN
11	you listen song	تو ٻڌو گانو	Tou bhudho gano	Tou/NNP bhudho/VBD gano/RB
12	Hina broke the glass	حنا ٽوڙيو ڪلاس	Hina tourdyo glass	Hina/NNP tourdyo/VBD glass/NN
13	I find door	مان گوليو دروازو	Ma goliyo darwazo	Ma/NNP goliyo/VBD darwazo/NN
14	I learnt English	مان سکي انگلش	Ma sikhi English	Ma/NNP sikhi/NN English/NNP
15	You make tea	تون ٺاهه چانهه	Tou thai chanhe	Tou/NNP thai/VBP chanhe/PRP
16	You are beautiful	تون آهين خوبصورت	Tou ahen khoubsorat	Tou/NNP ahen/VBD khoubsorat/JJ
17	You are bad	تون آهين ڪينو	Tou ahen kino	Tou/NNP ahen/VBD kino/NN
18	Are you well?	آهين تون ٺيڪ	Ahen tou thek?	Error
19	Dog barks	ڪتو پونڪي ٿو	Kuto bhonke tho	Kuto/NNP bhonke/VBP tho/WP
20	I wrote article	مان لکيو آرٽيڪل	Ma likhyo article	Ma/NNP likhyo/VBD article/NN
21	Sarah sits	سارا ويهه	Sara wehu	Sara/NNP wehu/VBD
22	I am sad	مون کي اهي ڏڪ	Mounkhe ahe dukh	Mounkhe/NNP ahe/VBP dukh/NN
23	I am happy	مان اهيان خوش	Ma ahyan kush	Ma/NNP ahyan/VBD kush/JJ
24	Sara stand up	سارا اٿي بيهه	Sara uthee beehe	Sara/NNP uthee/VBP beehe/PRP
25	You are teacher	تون آهين استاد	Tou ahen ustad	Tou/NNP ahen/VBD ustad/NN
26	I learn Sindhi	مان سکڻ ٿي سنڌي	Ma sikhan thi Sindhi	Ma/NNP sikhan/VBD thi/NN Sindhi/NNP
27	I learn math	مان سکڻ ٿي ميٿ	Ma sikhan thi math	Ma/NNP sikhan/VBD thi/NN math/NN
28	Ali killed crocodile	علي ماريو واڳون	Ali maryo nang	Ali/NNP maryo/VBD nang/NN
29	Ali sit	علي ويهه	Ali wehu	Ali/NNP wehu/VBD
30	Anam came	انعم اچ	Anam ach	Anam/NNP ach/VBP
31	I am teacher	مان اهيان استاد	Ma ahyan ustad	Ma/NNP ahyan/VBD ustad/NN
32	Are you doctor	آهين تون ڊاڪٽر	Ahin toun doctor?	Issue in interrogative
33	I operate machine	مان هلائي مشين	Ma halai machine	Ma/NNP halai/VBP machine/NN
34	Anam came here	انعم اچ هتي	Anam ach hete	Anam/NNP ach/VBP hete/JJ
35	I go to school	مان وڃان ٿو اسڪول	Ma wanjan tho school	Ma/NNP wanjan/VBD tho/NN school/NN
36	Are you student?	آهين تون شاگرد	Ahin toun shagrid?	Error
37	Am i doctor?	آهين مان ڊاڪٽر	Ahyan ma doctor	Error
38	She is teacher	هوءَ آهي استاد	Hawa ahe ustad	Huwa/NNP ahe/VBP ustad/JJ
39	I have work in London	مون کي آهي ڪم لنڊن ۾	Mounkhe ahe kam London m	Mounkhe/NNP ahe/VBP kam/NN London/NNP m/NN
40	You live in Nawabshah	تون رهين ٿو نواب شاهه ۾	Toun rahen tho Nawabshah m	Toun/NNP rahen/VBD tho/NN Nawabshah/NNP m/NN
41	You eat mango	تو کادو انب	Tou khado amb	Tou/NNP khado/VBP amb/NN
42	She run on road	هوءَ ڊوڙي ٿي روڊ تي	Huwa dore thi road te	Huwa/NNP dore/VBD thi/NN road/NN te/NN
43	I like pizza	مان ڪيان ٿي پسند پيزا	Ma kayan thi pasand pizza	Ma/NNP kayan/VBD thi/NN pasand/NN pizza/NN
44	He ignore me	هي ڪري ٿو نظر انداز	He kre tho nazarandaz moun	He/PRP kre/VBD tho/RB nazarandaz/NN moun/NN khe/NN
45	He is intelligent	هي آهي هوشيار	He ahy hoshar	He/PRP ahy/VBD hoshar/NN
46	I like banana	مان ڪيان ٿي پسند ڪيلا	Ma kayan thi pasand kela	Ma/NNP kayan/VBD thi/NN pasand/NN kela/NN
47	Do i like banana?	ڪيان ٿي مان پسند ڪيلا	Kayan thi ma pasand kela?	Error
48	I play football	مان کيڏان ٿي فٽ بال	Ma khedan thi football	Ma/NNP khedan/VBD thi/NN football/NN
49	I play cricket	مان کيڏان ٿي ڪرڪيٽ	Ma khedan thi circket	Ma/NNP khedan/VBD thi/NN circket/NN
50	I read book	مان پڙهان ٿو ڪتاب	Ma parhan tho kitab	Ma/NNP parhan/VBD tho/NN kitab/NN
51	You help me	تون مدد ڪندي منهنجي	Tou madad kande mounhji	Tou/NNP madad/VBD kande/NN mounhji/NN
52	You leave now	تون هليو وڃ هاڻي	Tou halyo wanj hanne	Tou/NNP halyo/VBD wanj/NN hanne/NN

53	You leave now please	تون هاليو وج هائي مهربياني ڪري	Tou halyo manj hanne maherbani kre	Tou/NNP halyo/VBD manj/NN hanne/NN maherbani/NN kre/NN
54	Ali sleeps	علي سمهي ٿو	Ali sumhe tho	Ali/NNP sumhe/VBP tho/WP
55	Sara eats mango	سارا ڪائي ٿي انب	Sara khae thi amb	Sara/NNP khae/VBP thi/NN amb/NN
56	Who are you?	ڪير آهين تون	Kair ahen tou	Kair/NNP ahen/VBD tou/PRP
57	Father name	پيءُ جو نالو	Peeu jo nalo	Error
58	Mother name	ماءُ جو نالو	Maau jo nalo	Error
59	Brother name	ڀاءُ جو نالو	Bhau jo nalo	Error
60	Sister name	ڀيڻ جو نالو	Bheen jo nalo	Error
61	I like rice	مان ڪيان ٿي پسند چانور	Mai kayan thi pasand chanwar	Ma/NNP kayan/VBD thi/NN pasand/NN chanwar/NN
62	Sanam is here	صنم آهي هتي	Sanam ahe hete	Sanam/NNP ahe/VBP hete/JJ
63	She is my mother	هي آهي منهنجي ماءُ	He ahy mounhji maau	He/PRP ahy/VBD mounhji/PRP maa/NN
64	He is my father	هي آهي منهنجو پيءُ	He ahy mounjo peeu	He/PRP ahy/VBD mounjo/RB peeu/NN
65	Ali is here	علي آهي هتي	Ali ahe hete	Ali/NNP ahe/VBP hete/JJ
66	Sara is a teacher	سارا آهي استاد	Sara ahe ustad	Sara/NNP ahe/VBP ustad/JJ
67	Iqra is doctor	اڀرا آهي ڊاڪٽر	Iqra ahy doctor	Iqra/NNP ahe/VBP doctor/NN
68	People like rice	ماڻهو پسند ڪن ٿا چانور	manho pasand Kan tha chanwar	manho/NN pasand/VBD kan/NN tha/NN chanwar/NN
69	People like boil rice	ماڻهو پسند ڪن ٿا اباريل چانور	Manho pasand kan tha umarial chanwar	Manho/NNP pasand/VBD kan/NN tha/NN umarial/NN chanwar/NN
70	People like tea	ماڻهو پسند ڪن ٿا چانهين	Manho pasand kan tha chanhe	Manho/NNP pasand/VBD kan/NN tha/NN chanhe/NN
71	You played with me	تون ڪيڏين ٿي مون سان	Tou kheden thi moun san	Tou/NNP kheden/VBD thi/NN moun/NN san/NN
72	Box is red	ڊبو آهي ڳاڙهو	Dabho ahy gahro	Dabho/NNP ahe/VBP gahro/NN
73	I saw cat	مان ڏيئي ٻلي	Ma detho bhli khe	Ma/NNP detho/VBD bhli/NN khe/NN
74	Dog is here.	ڪتو آهي هتي	Kuto ahe hete	Kuto/NNP ahe/VBP hete/JJ
75	You speak English	تون ڳالهين ٿو انگلش	Tou galhaen tho English	Tou/NNP galhaen/VBD tho/NN English/NNP
76	Do not forget.	نه وساريو	Na wesaryo	Na/NNP wesaryo/VBD
77	Do not afraid	نه ڊرڇو	Na drejo	Na/NNP drejo/VBD
78	You speak lie.	تون ڳالهائو ڪوڙ	Tou galhayo koor	Tou/NNP galhayo/VBD koor/NN
79	Take tea	کٽو چانهين	Khano chahen	Error
80	Do not come here	نه اچو هتي	Na acho hete	Na/NNP acho/VBD hete/JJ
81	Cat runs	ٻلي ڊورڙي ٿي	Bhli dorhe thi	Bhli/NNP dorhe/VBP thi/NN
82	He is tom	هي آهي ٽوم	He ahy tom	He/PRP ahe/VBD tom/PRP
83	Tree is big	وڻ آهي وڏو	Wanu ahe wadho	Wanu/NNP ahe/VBP wadho/WP
84	Sun is hot	سج آهي گرم	Sijh ahy garam	Sijh/NNP ahe/VBP garam/NN
85	I eat cake	مان کاتو ڪيڪ	Ma khado cake	Ma/NNP khado/VBP cake/NN
86	I do not afraid	مان نه ٿو ڊرڇان	Ma na tho drjan tho	Issue
87	What is the problem	ڇا آهي مسئلو	Cha ahy masalo	Cha/NNP ahe/VBP masalo/NN
88	No problem	ڪو به مسئلو نه آهي	Ko b masalo nahy	Error
89	You came here	تون اچ هيدان	Tou ach dehan	Tou/NNP ach/VBP dehan/IN
90	You sit at home	تون ويهه گهر	Tou wehu ghar	Tou/NNP wehu/VBD ghar/NN
91	This is your problem	اهو آهي مسئلو توهان	Eho ahe masalo tawahan jo	Eho/NNP ahe/VBP masalo/NN tawahan/IN jo/NN
92	Do not create problem	نه ڪيو پيدا مسئلو	Na kayo paida masalo	Na/NNP kayo/VBD paida/NN masalo/NN
93	I do not afraid from frog	مان نه ٿو ڊرڇان	Ma na tho drjan dedar khan	Error
94	I like eggs	مان ڪيان ٿو پسند بيضا	Ma kayan tho pasand baize	Ma/NNP kayan/VBD tho/NN pasand/NN baiza/NN
95	I have cough	مون کي آهي ڪنگ	Moun khe ahy khang	Mounkhe/NNP ahe/VBP khang/JJ
96	I have flu	مون کي آهي زڪام	Moun khe ahe zukam	Mounkhe/NNP ahe/VBP zukam/NN
97	Where are do you live	ڪٿي آهيو رهندا	Kethe ahyu rehanda	Kethe/NNP ahyu/VBD rehanda/NN
98	I live in Karachi	مان رهندي آهيان ڪراچي	Ma rahnde ahyan Karachi	Ma/NNP rahnde/VBP ahyan/JJ Karachi/NNP
99	Dog barks always	ڪتا پوڪندا آهن هميشه	kuto bhonkando ahy hamesha	kuto/NN bhonkando/VBP ahy/JJ hamesha/NN
100	Do not think	نه سوچيو	Na sochy	Na/NNP sochy/VBD

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