

Query Word Labeling and Back Transliteration for Indian Languages: MSRI Shared task system description

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SubTask1: Query Word Labeling

Many Indian languages esp. in social media is written using romanized script

Input	Query Labeling	Back-Transliteration
sachin tendulkar number of centuries	sachin\H tendulkar\H number\E of\E centuries\E	सचिन तेंदुलकर number of centuries
palak paneer recipe	palak\H paneer\H recipe\E	पालक पनीर recipe
mungeri lal ke haseen sapney	mungeri\H lal\H ke\H haseen\H sapney\H	मुंगेरी लाल के हसीन सपने
iguazu water fall argentina	iguazu\E water\E fall\E argentina\E	iguazu water fall argentina

Table: Shared Task description in two seperate steps of query labeling and back transliteration

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Our Methodology

- Word level language identification
 - based on character n-gram features learned from wordlists extracted from monolingual corpus ("King and "Abney, 2013)
 - Adding context switch probability to indirectly learn the language sequence patterns
 - Frequency based filtering
- Back-Transliteration
 - Hash based mapping between source and target languages (Kumar and Udupa, 2011)
 - Use indic character mapping to create training data in poor-resource languages

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Terminology, Datasets and Tools

- Character n-gram features: hello : 'h','e',...,'o','he','el'...,'hel'...,'hell','ello','hello'
- Training resources: Word lists (from Leipzig Corpus, Anandbazar Patrika), word frequencies and transliterated pairs given as part of shared task
- Training size from 100 - 5000 words (Always ≤ 546 for gujarati)
- (McCallum, 2002) for learning classifiers, MSRI Name Search Tool for Transliteration

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Word label prediction based on n-gram features

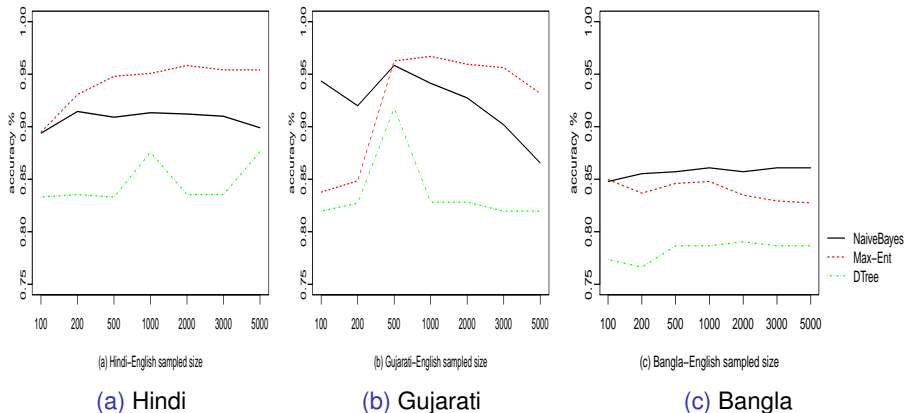
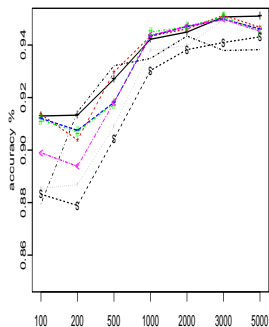


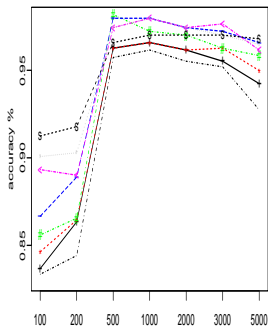
Figure: Learning curves for maximum entropy, naive Bayes and decision tree on word labeling for Hindi, Gujarati and Bangla language on development data

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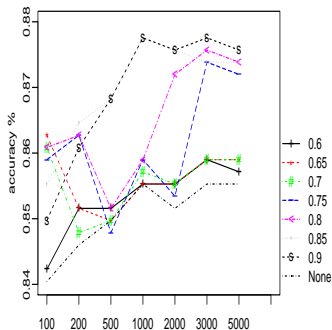
Adding context-switch probability



(a) Hindi - Maxent



(b) Gujarati - Maxent



(c) Bangla - Naive

Figure: Learning curves with varying context switch probabilities

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Language Identification Errors

Type	Romanized	Predicted	Reference
Short Words	i; ve	H; E	E; H
Ambiguous Words	the; ate	E; E	H; H
Erroneous Words	emosal	H	E
Mixed Numerals Words	zara2; duwan2	E; E	H; H

Table: Annotation Errors

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Back Transliteration

- MSRI Name Search Tool, built based on n-gram based feature hashing
- Used indic character mapping between Hindi-Bangla and Hindi-Gujarati
- All 3 systems for Gujarati and Bangla uses indic character mapping

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Test set Results

System	Hindi			Gujarati			Bangla		
	LA	TF	TQM	LA	TF	TQM	LA	TF	TQM
MSRI-1	0.9823	0.8127	0.1940	0.9614	0.4711	0.0800	0.9259	0.4914	0.0100
MSRI-2	0.9848	0.8130	0.1980	0.9755	0.4803	0.0733	0.9499	0.5033	0.0100
MSRI-3	0.9826	0.8101	0.1860	0.9661	0.4748	0.0667	0.9459	0.5137	0.0100
Maximum	0.9848	0.8130	0.1980	0.9755	0.4803	0.0800	0.9499	0.5137	0.0100
Median	0.9540	0.4160	0.0290	0.9661	0.4748	0.0733	0.9359	0.4973	0.0100

Table: Language labeling analysis on submitted runs in all three languages, along with maximum and median scores. Our runs which had maximum scores are presented in **bold**. LA - Labeling Accuracy, TF- Transliteration F-score, TQM - % of queries that had exact labeling and transliteration

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Transliteration Error Analysis

Type	Romanized	Predicted	Reference
Erroneous Latin Source	hau\H; utari\G; banglae\B	हाउ; उतारी; बंगल	है; उत्तारो; बांग्ला
Multiple Candidates	kali\H; vidhi\G; par\B	काली; विधि; पार	कली; विधि; पार
Multiple Transcriptions	tanhai\H; barbadi\G	तनहाई; बर्बादी	तन्हाई; बरबादी
Merged Words	gayazamana\H; hridayama\G; saralikiraner\B	घनश्याम; ह्रमदई; सररक्षण	गयाजमाना; ह्रदयमा; सरलीकरण
Plural Words	neendo\H; mandiro\G	नींदो; मंदिरो	नींदो; मंदिरो
Distorted Words	mauja\H	मौज	मौजा
Language Specific	paani\G; kolkatar\B	पानी; कोलकातार	पाणी; कलकातार
Lexicon Coverage	chaudavi\H	चढाव	चौदवी
Vowel Error	Gai\B; bali\B	गाले; बाली	गहे; बालि
Errors in Training Set	bijuriya\H; nahi\G	बिजुरिय; नहि	बिजुरिया; नहीं
Miscellaneous	bina\H	बिना	सिवा

Table: Transliteration Errors

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Summary

- Contributions:
 - Using context switch probability increases the performance of language labeling in code-mixed language.
 - Cross-language character mapping to increase transliteration accuracy - promising direction for resource-poor languages
- Future Work:
 - Extending it to text with spelling variations (covering text normalization)
 - Working on multiple languages esp. poor resource languages by exploiting resources from related languages

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Questions?

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