Challenges of Processing South Asian Languages (CPSAL)

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Course outline

- **Topics (Tentative):**
  - Day 01: Languages, Scripts, and Encoding of South Asian Languages.
  - **Day 02: Phonology, Transliteration and Morphology of South Asian Languages.**
  - Day 03: Part of Speech and Multiword tokenisation
  - Day 04: Syntax, Morphosyntax, and Semantics of South Asian Languages.
  - Day 05: Deep Learning for South Asian Languages and winding up the course.

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Day 02: Transliteration/Phonology and Morphology of South Asian Languages.

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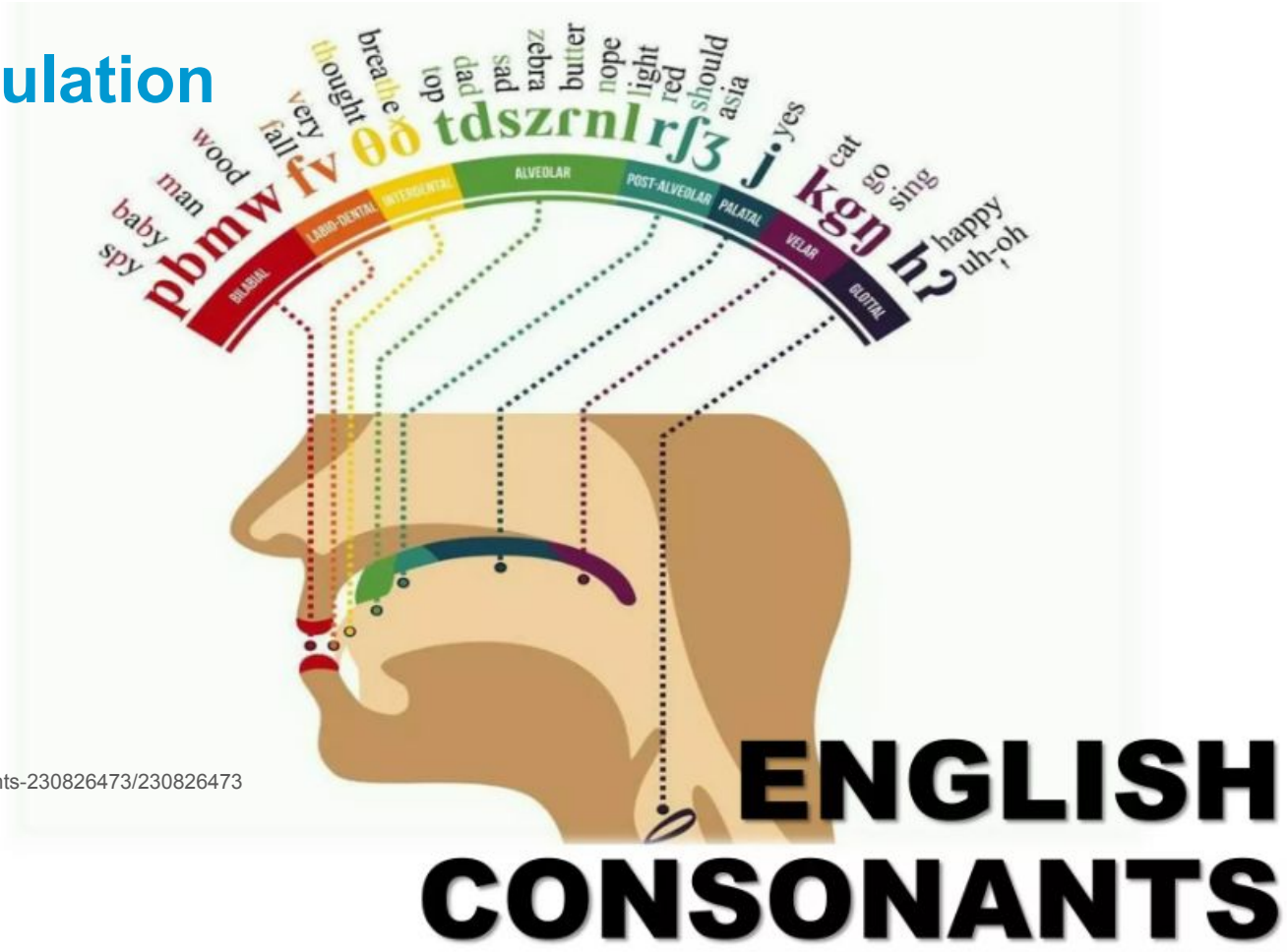
ESSLLI 2024 European Summer School of Logic, Language and Information Leuven

Position of Articulation

- Bilabial
- Labio-Dental
- InterDental
- Alveolar
- Palatal
- Velar
- Glottal



https://www.slideshare.net/slideshow/english-consonants-230826473/230826473

Position and manner of articulation

	bilabial	labio-dental	dental	alveolar	post-alveolar	palatal	velar	glottal
stop	p b			t d			k g	ʔ
nasal	m			n			ŋ	
flap				ɾ				
fricative		f v	θ ð	s z	ʃ ʒ			h
approximant				ɹ		j		
lateral approximant				l				

https://open.maricopa.edu/essentialsoflinguistics/chapter/3-3-need-to-add-tables-ipa-for-canadian-english/

Consonants in Sindhi

PLACE / MANNER		Bilabial	Labio-dental	Dental	Alveolar	Retroflex	Alveo-Palatal	Palatal	Velar	Glottal
Stop	Plosive	p b pʰ bʰ		t̪ d̪ t̪ʰ d̪ʰ		ʈ ɖ ʈ ʰ ɖʰ			k g kʰ gʰ	ʔ
	implosive	ɓ				ɗ		ʃ	ɠ	
Nasal		m			n nʰ	ɳ ɳʰ		ɲ	ŋ	
Fricative			f v		s z			ʃ	x ɣ	h
Affricate							tʃ dʒ tʃʰ dʒʰ			
Trill					r rʰ					
Flap						ɾ ɾʰ				
Lateral					l lʰ					
Approximant								j		

Table 1: Consonantal Inventory of Sindhi

https://uogenglish.wordpress.com/wp-content/uploads/2011/07/sindhi-phonemic-inventory.pdf

Tamil consonants

	Labial	Dental	Alveolar	Retroflex	(Alveolo-) palatal	Velar	Glottal
Nasal	m ம்	(n̪) ந்	n ன்	ɳ ண்	ɲ ஞ்	(ŋ) ங்	
Plosive/ Affricate	p ப்	t̪ த்	(tːr ற்ற)	ʈ ட்	t͡ɕ ~ t͡ʃ ச்[5]	k க்	
Fricative	(f)[1]		s[5] ஸ் (z)[1]	(ʂ)[1] ஷ்	(ɕ)[1] ஶ்	(x)[2]	(h)[2] ஹ்
Tap			ɾ ர்				
Trill			r ற்				
Approximant	ʋ வ்			ɻ ழ்	j ய்		
Lateral approximant			l ல்	ɭ ள்			

https://www.cambridge.org/core/services/aop-cambridge-core/content/view/5BE3F9D1C8291CDA6B3610F0E1079C02/S0025100304001549a.pdf/tamil.pdf
https://en.wikipedia.org/wiki/Tamil_phonology

Interesting/Uncommon Features - Some examples

- **Aspirated Consonants**

		Sindhi	Hindi	Urdu
unaspirated	b	ب	ब	ب
aspirated	b^h	ڀ	भ	ب ھ

- **Retroflex Consonants**

		Sindhi	Hindi	Urdu
Dental	t̪	ت	त	ت
Retroflex	ʈ	ٹ	ट	ٹ

Interesting/Uncommon Features

Implosive Consonants:

		Sindhi
Plosive	b	ب
Implosive	ɓ	ٻ

Foreign Sounds

Consonants:

Foreign	Origin	Nearest Native	Sindhi	Hindi
f	Persian/Arabic, English	pʰ	ف	फ़
x	Persian/Arabic	kʰ	خ	ख़

Vowels:

Urdu/Hindi: bɛ:l (bull), be:l (creeper plant)

People know how to pronounce the borrowed English words *bell (bɛl)*, and *cell (sɛl)* etc. However, there is no symbol to represent these in traditional orthography.

Sandhi - Example Tamil

- Internal Sandhi / External Sandhi
  - Phonological change that occurs when two morphs are concatenated together
- External Sandhi (Gemination of stops)
  - Word initial stops are geminated in Tamil when preceded by either a short vowel or a glide - this rule does not always apply even when these phonological conditions are met!
  - The phonological phenomenon is shown to be 'directly syntax-driven??
    - If word initial k, t, p is preceded by a noun in the accusative case, a noun in the dative case, a demonstrative or interrogative adjective (inta, anta,enta), an infinitive or one of the adverbs ippaDi 'like this', appaDi 'like that', eppaDi 'how', the realisation is with a voiceless plosive….

Nagarajan, H. (1995). *Gemination of stops in Tamil: implications for the phonology-syntax interface* (Vol. 7, pp. 495-509). UCL Working Papers in Linguistics.

Sandhi - A few example in Tamil

anta = ppustakattay = kkuDu
that book (acc) give imp.
Give (me) that book.
(Dem=N,Obj.NP=V)

avanukku = ppaNam kuDutteen
him (dat) money give past 1s.
(I) gave him money.
(I.O=D.O)

raamanukku = ppacikkiradu
ram (dat) hunger pres 3p.
Rama is hungry.
(Dative subj.=V)

kaar-ootti centran
kaar-driver go past 1sm
Car driver went
(kaarootti - the one who drives car)

kaar-ootti =(c) centran
Car-drive.Inf =(c) go past 1sm
(he) drove a car.

Transliteration standards

- ISO_15919: Transliteration of Devanagari and related Indic scripts into Latin characters
  - https://en.wikipedia.org/wiki/ISO_15919
- ISO 233-3:2023: Transliteration of Arabic characters into Latin characters
  - https://en.wikipedia.org/wiki/ISO_233

Transliteration standards

- Not all sounds have an orthographic character

p	paṯʉ	*pattu*	‘ten’
[b]	ṯambi	*tampi*	‘younger brother’
(b)	baḏıl	*patil*	‘answer’
ṯ	ṯapʉ	*tappu*	‘mistake’
[ḏ]	paṉḏʉ	*pantu*	‘ball’
(ḏ)	ḏinəm	*tinam*	‘day’
ʈ			
[ɖ]	ʋanɳɖi	*vanʈi*	‘cart’
k	kaːl	*kaal*	‘leg’
[g]	aŋgeː	*aŋkee*	‘there’
(g)	ganəm	*kanam*	‘heaviness’
tʃ	tʃınːə	*cinna*	‘small’

Morphology

What can you find out about morphology?

1	அவன் அழுதான்	avaṉ aḻutāṉ
	He cried	
2	அவள் அழுதாள்	avaḷ aḻutāḷ
	She Cried	
3	அவன் அழுகிறான்	avaṉ aḻukiṟāṉ
	He is crying	
4	அவள் அழுகிறாள்	avaḷ aḻukiṟāḷ
	She is crying	
5	அவன் அழுவான்	avaṉ aḻuvāṉ
	He will cry	
6	அவள் அழுவாள்	avaḷ aḻuvāḷ

7	அவர்கள் அழுதனர்	avarkaḷ aḻutaṉar
	They cried	
8	அவர்கள் அழுகின்றனர்	avarkaḷ aḻukiṉṟaṉar
	They are crying	
9	அவர்கள் அழுவார்கள்	avarkaḷ aḻuvārkaḷ
	They will cry	