

Understanding Language Evolution Using an Event-Based Model

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Introduction

Modern languages are related to one another through a complicated history of divergence and word borrowing. The divergence of languages is caused by the slow change in spoken language as it is passed from parents to offspring. Over time, divergence causes languages to become increasingly different from one another, ultimately to the point where they are mutually unintelligible. Languages that were spoken by the same human group more recently in time are considered to be more closely related to each other than they are to groups that spoke the language more distantly in time; this relatedness information can be depicted by a tree-like diagram called a ‘phylogeny.’ Linguistic borrowing, by contrast, causes languages to become more similar to one another.

Language	IPA	Coding
English	/hænd/	0
German	/hant/	0
French	/mẽ/	1
Spanish	/mano/	1
Italian	/ma:no/	1
Russian	/rɔka/	2
Polish	/rɛŋka/	2

Table 1. Coding of lexical cognates for the word *hand*.

Languages

Latin



French



Spanish



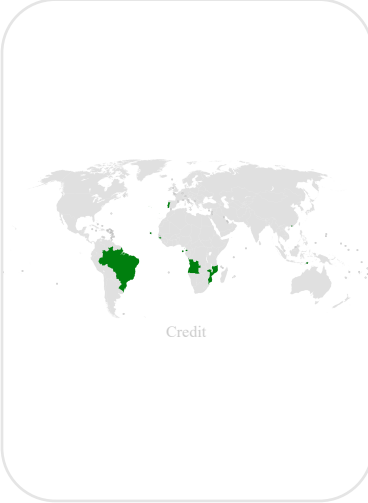
Italian



Brazilian Portuguese



Portuguese



Catalan



Walloon



Friulian



Romanian



Concepts Used

	I	We	YouPlural	YouSingular	YouSingular-VostramMercWoman	
Latin	- e g o:	n o: - s -	w o: - s	t u:		f e: - m i - n - a
French	ʒ ə - -	n u - - -	v u - -	t y		f a - m - - -
Spanish	j - - o	n o - s -	b o - s	t u	- u s t e d	- e - m - b r - a
Italian	i - - o	n o: i - -	v o: i - -	t u		f e m m i - n - a
PortugueseBrazi	- e - w	n ɔ j - s	v ɔ j s	t u	v o s - e -	f e - m e - - - v
Portuguese	- e - w	n ɔ - f -	v o - f	t u	v ɔ s - e -	f e - m j - - - v
Catalan	ʒ - - ɔ		b u - s	t u	v o s t e -	f e - m - b r - a
Walloon	ɖ ɪ - -	n o - - -	v o - s	t y		f æ - m - - - -
Friulian	j - - o	n o: - - -	v o: - -	t u		f ε - m i - n - ε
Romanian	j e - w	n o j - - -	v o j - -	t u		f e - m e - - j e
	Woman-Mulier	Woman-Domina	ManHumanBeing	ManHumanBeing-Homo	Child	Child-Ninnus
Latin	m u l i e r e m	d o m i n a	h o m i - n e m	- h o m o:	i n f a n t e m	
French		d a m - - -	- ɔ m - - - -	- ɔ̃ - - -	ã - f ã - - -	
Spanish	m u x - e r - -	d o - - p a	o m - b r e - -		i n f a n t e -	n i p o
Italian	m o ʎ ʎ e - - -	d ɔ n - n a		w ɔ m o -	- f a n t e -	n i n o
PortugueseBrazi	m u ʎ - e ʁ - -	d o - - n e	o m ẽj - - - -		ĩ - f ẽ - t j i -	n e n ẽj
Portuguese	m u ʎ - e r - - -	d o - - n e	ɔ m ẽj - - - -		ĩ - f ẽ - t i -	n e n ẽj
Catalan	m u ʎ - e - - -	d ɔ - - n ə	- ɔ m ə - - - -			n e n -
Walloon		d æ m - - -	- ɔ m - - - -		ε - f ã - - - -	
Friulian	m u - - i: r - -	d ɔ - - n e	- ɔ m - - - -			
Romanian	m u - j e r e -	d ɔ am - n ə	- o m - - - -			
	Wife	Wife-Mulier	Husband	Husband-Sponsus	Husband-Socius	Mother
Latin	- s p o n s a	m u l i e r -	m a r i: t u s	- s p o n s u s	s o k i u s	m a: t r e m
French	e - p u - z -		m a ʁ i - - -	e - p u - - -		m e - ʁ - -
Spanish	e s p o - s a	m u x - e r -	m a r i ð o -	e s p o - s o -		m a ð r e -
Italian	- s p ɔ - z a	m o ʎ ʎ e - -	m a r i t o -	- s p ɔ - z o -	s ɔ t j - o -	m a: d r e -
PortugueseBrazi	i s p o - z a	m u ʎ - e ʁ -	m a r i d u -	i s p o - z u -		m ẽj - - - -
Portuguese	i f p o - z v	m u ʎ - e r -	m ɐ r i ð u -	i f p o - z u -		m ẽj - - - -
Catalan	ə s p ɔ - z ə	m u ʎ - e - -	m a r i t - - -	ə s p ɔ - s - -		m a - r ə -
Walloon						m e - ʁ - -
Friulian		m u - i: r - -	m a r i: t - -	- s p o: - s - -		m a - r i -
Romanian		m u - j e r e	m ă r i t - -		s o t s - - -	

	Father	Father-Tata	Animal	Animal-Bestia	Fish-Piskem	Fish-Pescion
Latin	p a t r e	t a t a	a n i m a l i a	b e: s t i a	p i s k e m	
French	p e - ʁ -		o - - m a - j			p w a s ð
Spanish	p a ð r e	t a t a	a l i m a j n - a		p e θ - - -	
Italian	p a: d r e	t a t a		b i f f - a	p e f f e -	
PortugueseBrazi	p a j - - -	t a t a		b i - f - e	p e j f - i -	
Portuguese	p a j - - -	t a t a		b i - f - e	p e j f - i -	
Catalan	p a - r ə				p e f - - -	
Walloon	p ɛ: - r -					p - ɛ h ð
Friulian	p a - r i		n e m a: l - - -	b i s - - -	p ɛ s - - -	
Romanian		t a t ə	- n ə m a - j e		p e f t e -	
	Bird-Avem	Bird-Avicellum	Bird-Passerem	Louse	Fruit	Flower
Latin	a w e m	- a w i - k - e l l u m	p a s s e r e m	p - e d u - k l u s	f r u: - k t u s	f l o: r e m
French		w a - - - z - o - - -		p - u - - - - -	f ʁ ɥ i - - -	f l œ ʁ - -
Spanish	a b e -		p a - x a r o -	p j o - - x - o - -	f r u - - t o -	f l o r - -
Italian		- - u - t ʃ - ɛ l l o -	p a s s e r o -	p - i d ɔ k k j o -	f r u - t t o -	f j o: r e -
PortugueseBrazi	a v i -		p a - s e r u -	p - i - o - ʎ u - -	f r u - - t e -	f l o ʁ - -
Portuguese	a v i -		p a - s e r u -	p - i - o - ʎ u - -	f r u - - t e -	f l o r - -
Catalan	a w - -	- - u - - s - e - ʎ - -		p - o - - - ʎ - - -	f r u j - t - -	f l ɔ - - -
Walloon		- - u: - - h - ɛ: - - -		p j u - - - - -	f ʁ y - - - -	f l ø: ʁ - -
Friulian		- - u - - ʃ j ɛ - l - -		p - e d o - l i - -	f r u - - t - -	f l o: r - -
Romanian			p a - s ə r e -	p - ə d u k - j e -	f r u - k t - -	f l ɔ a r e -
	Nose	Nose-Nares	Mouth	Mouth-Gula	Sun	Sun-Soliculus
Latin	n a: s u s		b u k k a	g u l a	s o: l e m	s o l i k u l u s
French	n e - - -		b u - f -			s ɔ l ɛ j - - - -
Spanish	n a s o -	n a r i θ -	b o - k a		s o l - -	
Italian	n a: s o -	n a r i ʃ e	b o k k a		s o l e -	
PortugueseBrazi		n a r i s -	b o - k e		s ɔ w - -	
Portuguese		n e r i f -	b o - k e		s ɔ ʔ - -	
Catalan	n a s - -	n a: r i s -	b o - k ə		s ɔ l - -	
Walloon	n e - - -		b ɔ k - -		s ɔ l ɔ -	
Friulian	n a: s - -		b ɔ - c ɛ			s o r e - - - l i -
Romanian	n a s - -		b u - k ə	g u r ə	s ɔ a r e -	

	Moon	Star	Water	Rain	Lake	Sea
Latin	l u : n a	- s t - e : l l a	a - k ^w - a	p l u - w i a	l a k u m	m a r e
French	l y n -	e - t w a - l -	o - - -	p l ũ - - i -	l a k - -	m ε ʁ -
Spanish	l u n a	e s t r e - j a	a - ɣ w a	j - u - b j a	l a g o -	m a r -
Italian	l u n a	- s t - e l l a	a k k w a	p j o d ɔ̃ - a	l a g o -	m a r e
PortugueseBrazi	l u - e	i s t r e - l e	a - g w e	ʃ - u - v - e	l a g u -	m a ʁ -
Portuguese	l u - e	i ʃ t r e - l e	a - g w e	ʃ - u - v - e	l a ɣ u -	m a r -
Catalan	ʎ u n ə	ə s t - ε - l -	aj - ɣ w ə	p l u - ʒ - ə	ʎ a k - -	m a r -
Walloon	l ø n -	- s t - ø : - l -	ε : - - w -	p l u : - ʁ - -	l a k - -	m e ʁ -
Friulian	l u n e	- s t - ε - l e	a - g - e	p l o - - j e	l a : t - -	m a : r -
Romanian	l u n ə	- s t - ɛ a - - -	a - p - ə	p l ɔ a - - j e	l a k - -	m a r e
	Salt	Earth	Fog	Fog-Nebula	Fog-Tenebrae	Fog-Tenebras
Latin	s a : l e m	t - e r r a	k a : l i : g i n e m	n - e - b u l a	t e n e : b r a j	t - e n - e : b r a : s
French	s ε l - -	t - e - ʁ -		n j ɔ̃ - - l y		t - e n - ε b ʁ - -
Spanish	s a l - -	t j e - r a	k a l i - - n a -	n j e - b - l a		t - i n j e b l a s
Italian	s a l e -	t - ε r r a	k a l i ɔ̃ i n e -	n - e b b - j a	t ε : n e b r e	t - ε : n - e b r e -
PortugueseBrazi	s a w - -	t - e - ʁ e	k a l i ʒ ẽj - - -	n - ε - v w - e		
Portuguese	s a l - -	t - ε - ʁ e	k e l i ʒ ẽj - - -	n - ε - v w - e		t r - - - ε v - e ʃ
Catalan	s a l - -	t - ε - r ə		n - e - - w l ə		t - ə n - e b r ə s
Walloon	s e - - -	t - ε : - ʁ -				
Friulian	s a : l - -	t j ε - r e				
Romanian	s a r e -	ts - a - r ə		n e g u r ə - -		
	Fog-Fumata	Fog-Caecia	Sky	Wind	Fire-Focus	Year
Latin	f u : m a : t a	k a j k i a	k - a j l u m	w - e n t u m	f - o k u m	a n n u m
French	f y m e - -		s j ε l - -	v - ã - - - -	f - ø - - -	ã - - - -
Spanish	f u m a t a		θ j e l o -	b j e n t o -	f w e g o -	a - ɲ o -
Italian	f u m a : t a		ʃf - ε l o -	v - ε n t o -	f w ɔ̃ k o -	a n n o -
PortugueseBrazi	f u m a s e		s - ε w - -	v - ẽ - t u -	f - o g u -	e - n u -
Portuguese	f u m a s e		s - ε w - -	v - ẽ - t u -	f - o ɣ u -	e - n u -
Catalan			s - ε l - -	b - e n - - -	f - ɔ̃ k - -	a - ɲ - -
Walloon			s - i : ʁ - -	v - ẽ - - - -	f - ø : - - -	ã - - - -
Friulian	f u m a t e		ʃf - i : l - -	v - i n t - -	f - u : k - -	a - ɲ - -
Romanian		ʃ ɛ a ʃ - ə	ʃf - e r - -	v - i n t - -	f - o k - -	a n - - -

	Name-Nomen	Name-Nominem	Tongue	ToDrink	ToEat	ToEat-Manducare
Latin	n o : m e n	n o : m i n - e m	l i n g ^w - a	b i b - e r e	k o m e d e r e	m a n d u k a : r e
French	n ɔ̃ - - -		l ã - g - -	b - - w a ʁ -		m ã - ʒ - - e - -
Spanish		n o m - b r e -	l e ŋ g w a	b e b - e r -	k o m e - - r -	m a n d u k a r -
Italian	n o : m e -		l i n g w a	b e - - r e		m a n dʒ - - a r e
PortugueseBrazi	n o m i -		l i - g w e	b e b - e ʁ -	k o m e - - - -	m ê - ʒ - - a ʁ -
Portuguese	n o m i -		l i̇ - g w e	b i β - e r -	k u m - - e r -	m ê - ʒ - - a r -
Catalan	n ɔ m - -			b ɛ w - - r ə		m ə ɲ ʒ - - a - -
Walloon	n ɔ̃ - - -		l ẽy - - -	b - - ø : ʁ -		m a ɲ - - i : - -
Friulian	n ɔ ŋ - -		l ɛ n g - ɛ	b e v i - - -		m a ŋ ʃ - - a : - -
Romanian	n u m e -		l i m b - ə	b - - - ɛ a - -		m i n - - k a - -
	ToBite	ToBite-Morsicare	ToSuck	ToSpit	ToSpit-Exconspuere	ToSpit-Sputare
Latin	m - o r d e : r e	m o r s i k a : r e	s u : g e r e	k o n s p u e r e		- s p u t e r e
French	m - o ʁ d - ʁ -		s y s e - -	k ɔ̃ - s p y e - -		
Spanish	m - o r ð e r -	m o - s - k a r -			e s k u - p i r	e s p u t a r -
Italian	m - ɔ r d e r e	m o r s i k a r e				- s p u t a r e
PortugueseBrazi	m - o ʁ d e ʁ -	m u - s ə g a - -	s u g a ʁ -	k u - s p i ʁ - -		
Portuguese	m - u r ð e r -	m u - s ə g a r -	s u g a r -	k u - ʃ p i r - -		
Catalan		m u - s ə y a - -			ə s k u - p i -	
Walloon			s y s i : - -			
Friulian	m w a r d i - -		c u c a : - -			s p u d a : - - -
Romanian		m u r s e k a - -	s u dʒ e - -		- s k u j p a -	
	ToKnow	ToKnow-Sapere	ToKnow-Cognoscere	ToThink	ToThink-Pensare	ToFear
Latin	s k i : r e	s a p - e r e	k o g n o : s k e r e	k - o : g i t a : r e	p e : n s a : r e	t i m e : r e
French		s a v w a ʁ -	k ɔ̃ - n ɛ - t ʁ - -	k y - - i d e - -	p ã - s e - -	
Spanish		s a b - e r -	k o - n o θ e r - -	k w - - i d a r -	p e n s a r -	t e m e r -
Italian		s a p - e r e	k o - n o f f e r e	k - o dʒ i t a r e	p e n s a r e	t e m e r e
PortugueseBrazi		s a b - e ʁ -	k o - ɲ e s - e ʁ -	k - u ʒ i t a ʁ -	p ê - s a ʁ -	t e m e ʁ -
Portuguese		s ɐ b - e r -	k u - ɲ i s - e r -	k - u ʒ i t a r -	p ê - s a r -	t i m e r -
Catalan		s ə β - ɛ - -	k u - n ɛ ʃ - ə - -	k - u - j d a - -	p ə n s a - -	t e m ə - -
Walloon		s a v - ø : ʁ -	k i - n ɔ h - - -		p ê - s e - -	
Friulian		s a v - e : - -	k o - ɲ o s - i - -		p e ŋ s a : - -	t e m i - -
Romanian	ʃ t i - -		k u - n ɔ a ʃ t e - -	k - u dʒ e t a - -	p ə - s a - -	t e m e - -

	ToFear-Tremere	ToSleep	ToLive	ToDie	ToKill	ToKill-Adnecare
Latin	t r e m - e r e	d - o r m i : r e	w i : w e r e		n - e k a : r e	
French	k ʁ ê - d - ʁ -	d - ɔ ʁ m i ʁ -	v i v - ʁ -	m u ʁ i ʁ -	n w a j e - - -	
Spanish	t r e m - e r -	d - o r m i r -	b i b i r -	m o r i r -		a - n e g a r -
Italian	t r e m - a r e	d - o r m i r e	v i v e r e	m o r i r e		a n n e g a r e
PortugueseBrazi	t r e m - e ʁ -	d - o ʁ m i ʁ -	v i v e ʁ -	m o ʁ e ʁ -		
Portuguese	t r i m - e r -	d - u r m i r -	v i v e r -	m u ʁ e r -		
Catalan		d - u r m i - -	b i w - r ə	m u r i - -	n - ə g a - -	
Walloon		d w a ʁ m i - -		m ɔ r i - -		
Friulian	t r i m - a : - -	d - u r m i : - -	v i v i - -	m u r i : - -		
Romanian		d - o r m i - -	v i - a - -	m u r i - -	n - e k a - -	
	ToKill-Tutari	ToKill-Mactare	ToKill-Occidere	ToFight	ToFight-Battuere	ToHunt-Captiare
Latin	t u : - t a : r i	m a k t a : r e	o k k i : d e r e	p u g n a : r e	b a t t u e r e	k a p t i a : r e
French	t - ʁ - e - -	m a - t e - -	ɔ k s i - - ʁ -		b a t - - ʁ - -	ʃ a - s - e - -
Spanish		m a - t a r -		p u - ɲ a r -	b a - t - i r -	k a - θ - a r -
Italian			u t ʃ i d e r e	p u ɲ ɲ a r e	b a t t - e r e	k a t ʃ - a r e
PortugueseBrazi		m a - t a ʁ -			b a - t - e ʁ -	k a - s - a ʁ -
Portuguese		m ɐ - t a r -			b ɐ - t - e r -	k ɐ - s - a r -
Catalan		m ə - t a - -	u k s i - - - -	p u - ɲ a - -	b a - t - - r ə	k ə - s - a - -
Walloon	t u w - e - -				b a t - e - - -	ʃ ɛ - s - i : - -
Friulian		m a ʃ - a : - -			b a t - i - - -	c a - ʃ - a : - -
Romanian			u - ʃ i d e - -		b a t - e - - -	
	ToHit	ToCut	ToCut-Curtare	ToCut-Excurtare	ToCut-Taliare	ToSplit
Latin	p u l s a : r e	s - e k a : r e	k u r t a : r e	e k s k u r t a : r e	t a : - l i a : r e	d i : w i d e r e
French	p u - s e - -	s j e - - - -		e - - k u ʁ t e - -	t ɑ j - - e - -	
Spanish	p u - x a r -	s - e g a r -	k o r t a r -		t a - x - a r -	d i b i d i r -
Italian	p u l s a r e	s - e g a r e		- - s k o r t a r e	t a - ʎ ʎ a : r e	d i v i d e r e
PortugueseBrazi	p u - ʃ a ʁ -	s - e g a ʁ -	k o ʁ t a ʁ -		t a - ʎ - a ʁ -	ɔ i v i ɔ i ʁ -
Portuguese	p u - ʃ a r -	s - i ɣ a r -	k u r t a r -		t ɐ - ʎ - a r -	d i v i ð i r -
Catalan		s - ə ɣ a - -			t ə - ʎ - a - -	d i b i d i - -
Walloon					t ɛ - - j i : - -	
Friulian	p u l s a : - -	s - e - a : - -		- - s k u r t a : - -	t a - - j a : - -	d i v i d i - -
Romanian	p u l s a - -			- - s k u r t a - -	t ə - - j a - -	d i v i d e - -

	ToSplit-Scindere	ToSplit-Findere	ToSplit-Partire	ToSplit-Separare	ToStab	ToStab-lugulare
Latin	s k i n d e r e	f i n d e r e	p a r t i r e	s e p a r a r e -	p u n g e r e	j u g u l a r e
French	s - ẽ - d e - -	f ã - d - ɣ -	p a ɣ t i ɣ -	s ə - v - - - ɣ e	p w ẽ - d - ɣ -	ʒ y g y l e - -
Spanish		- e n d e r -	p a r t i r -	s e p a r a r - -		
Italian	ʃ - i n d e r e	f ɛ n d e r e	p a r t i r e	s e p a r a r e -	p - u n ɕ e r e	j u g u l a r e
PortugueseBrazi		f ẽ - d e ɣ -	p a ɣ ʃ i ɣ -	s e p a r a ɣ - -	p - ã - ʒ i ɣ -	
Portuguese		f ẽ - d e r -	p ɐ r t i r -	s i p ɐ r a r - -	p - ã - ʒ i r -	
Catalan		f ɛ n d - r ə	p ə r t i - -	s ə p ə r a - - -	p - u ɲ - i - -	
Walloon		f ẽ - t - - -	p ɔː r t i - -			
Friulian			p a r t iː - -	s e p a r aː - - -	p u n ɕ e - - -	
Romanian				s e p a r a - - -		
	ToScratch	ToScratch-Rasare	ToScratch-Rasicare	ToScratch-Coctiare	ToDig	ToDig-Cavare
Latin	r a d e r e				f o d e r e	k a w a r e
French		ɣ a z e - -			f w i ɣ - -	
Spanish	r a - e r -	r a s a r -	r a s k a r			k a b a r -
Italian	r a d e r e	r a s a r e				k a v a r e
PortugueseBrazi	ɣ a - e ɣ -	ɣ a z a ɣ -	ɣ a ʃ k a ɣ	k o s a ɹ		k ɐ v a ɣ -
Portuguese	ɣ ɐ - e r -	ɣ ɐ z a r -	ɣ ɐ ʃ k a r	k u s a r		k ɐ v a r -
Catalan	r a w - r ə	r ə z a - -	r ə s k a -			k ə b a - -
Walloon						ç aː v - l e
Friulian	r a d aː - -	r a s aː - -				ʃ a v aː - -
Romanian	r a d e - -					
	ToDig-Excavare	ToSwim	ToSwim-Navigare	ToFly	ToFly-Exvolare	ToWalk
Latin	e k s k a w a r e	n - a t a r e	n a v i g a r e	w o l a r e		
French			n a - - ʒ e - -	v o l e - -		ʃ ə m i n e - - -
Spanish	e s k a b a r - -	n - a d a r -	n a b e g a r -	b o l a r -		k a m i n a r - -
Italian	- - s k a v a r e	n w o t a r e	n a v i g a r e	v o l a r e	z v o l a r e	k a m m i n a r e
PortugueseBrazi	i - ʃ k ɐ v a ɣ -	n - a d a ɣ -	n a v i ɣ a ɣ -	v o - a ɣ -		k ɐ m i ɲ a ɣ - -
Portuguese	i - ʃ k ɐ v a r -	n - ɐ ð a r -	n ɐ v i ɣ a r -	v w - a r -		k ɐ m i ɲ a r - -
Catalan		n - ə d a - -	n ə b ə g a - -	b u l a - -		k ə m i n a - - -
Walloon			n ɛ - - ɕ iː - -	v ɔ l e - -		ʃ i m i n e - - -
Friulian	- - z ʃ a v aː - -	n - a d aː - -	n a v i g aː - -		z v o l aː - -	c a m i n aː - - -
Romanian			n a v i g a - -		z b u r a - - -	

	ToWalk-Marcher	ToWalk-Mergere	ToWalk-Ambitare	ToCome	ToLieAsInABed	ToLieAsInABed-lacere
Latin		m e r g e r e	a m b i t a r e	w e n i r e	e k s t e n d e r e	j a - k e r e
French	m a ʁ f e			v ə n i ʁ -	e - t ɑ̃ - d - ʁ - -	ʒ e - z i ʁ -
Spanish			a n d - - a r -	b e n i r -	e k s t e n d e r -	j a - θ e r -
Italian		m ε r dʒ e r e	a n d - - a r e	v e n i r e	e - s t ε n d e r e	ɖʒ a - tʃ e r e
PortugueseBrazi			ẽ - d - - a ʁ -	v - - i ʁ -	i s t ẽ - d e ʁ - -	ʒ e - z e ʁ -
Portuguese			ẽ - d - - a r -	v - - i r -	i f t ẽ - d e r - -	ʒ e - z e r -
Catalan				b ə n i - -	ə - s t e n d - r ə	ʒ a w - - r ə
Walloon	m aː R tʃ iː			v i n i - -		ɖʒ e - - r e -
Friulian				v i ɲ iː - -		j e - s i - -
Romanian		m e r dʒ e - -		v e n i - -	e k s t i n d e - -	z ə - tʃ ɛ a - -
	ToSit	ToSit-Sedentare	ToStand	ToStand-Levare	ToStand-Altiare	ToTurnIntransitive
Latin	s - e d e r e	s e d e n t a r e	- s t a r e	l e v a r e	- a l t i a r e	t o r n a r e
French	s w a - - ʁ -		ε - t - ʁ -	l ə v e - -	- o - s - e - -	t u ʁ n e - -
Spanish	s - e - - r -	s e - - n t a r -	e s t a r -	j e b a r -	- a l θ - a r -	t o r n a r -
Italian	s - e d e r e		- s t a r e	l e v a r e	- a l t s a r e -	t o r n a r e
PortugueseBrazi	s - e - - ʁ -	s ẽ - - - t a r -	i f t a r -	l e v a ʁ -	- a ł s - a - -	t o ʁ n a ʁ -
Portuguese	s - e - - r -	s ẽ - - - t a r -	i f t a r -	l i v a r -	- a ł s - a r -	t u r n a r -
Catalan			ə s t a - -	ʎ ə b a - -	- ə l s - a - -	t u r n a - -
Walloon			ε s - - -	l ə v e - -	h ɔː - s - iː - -	t uː r n e - -
Friulian		s e - - n t aː - -	- s t aː - -	l e v aː - -	- a l t f - aː -	t o r n aː - -
Romanian	f - e d ɛ a - -		- s t a - -	l - u a - -		t u r n a - -
	ToTurnIntransitive-Gyrare	ToTurnIntransitive-Ancestr	ToTurnIntransitive-Torquer	ToFall	ToFall-Tumbare	ToHold
Latin	g y r a r e		t o r k ^w e r e	k - a d e r e		t e n - e r e
French	ʒ i ʁ e - -	v i ʁ e - -	t ɔ ʁ d - ʁ -	f w a - - ʁ -	t ɔ̃ - b e -	t ə n - i ʁ -
Spanish	x i r a r -	b i r a r -	t o r θ e r -	k - a - e r -	t u m b a r	t e n - e r -
Italian	ɖʒ i r a r e	v i r a r e	t ɔ r tʃ e r e	k - a d e r e		t e n - e r e
PortugueseBrazi	ʒ i r a r -	v i r a r -	t u r s e r -	k - e - i r -	t ɔ̃ - b a ʁ	t e - - - ʁ -
Portuguese	ʒ i r a r -	ʒ i r a r -	t u r s e r -	k - e - i r -	t ɔ̃ - b a r	t e - - - r -
Catalan	ʒ i r a - -	b i r a - -	t ɔ r s ə - -	k - a w - r ə	t u m b a -	t ə n - i - -
Walloon		v i ʁ e - -		tʃ - εː - ʁ -	t u m - e -	t i n - i - -
Friulian	ɖʒ i r aː - -	ɖʒ i r aː - -		tʃ j a d e - -		t i n j i - -
Romanian			t ɔ a r tʃ e - -	k ə d ɛ a - -		t s i n - e - -

	ToHold-Segurar	ToSqueeze	ToSqueeze-Serrere	ToSqueeze-Serare	ToSqueeze-Appetorare	ToSqueeze-Stringere
Latin		e k s p r i m - e r e	s e r r e r e	s e - r a r e	a p p e k t o r a r e	- s t r i n g e r e
French		e - p ɤ ɛ̃ - d - ɤ -		s e - ɤ e - -		e - t ɤ ɛ̃ - d - ɤ -
Spanish	s e g u r a r	e k s p r e m - i r -	s e - r a r -	θ e - r a r -	a - p - - r e t a r -	e s t r e ɲ - i r -
Italian		- s p r e m - e r e		s e r r a r e		- s t r i n ɟ e r e
PortugueseBraz	s i g u r a ɤ	i - ʃ p r ə m - e ɤ -	s e - ɤ a - -	s i - ɤ a r -	e - p i - r - t a r -	ə ʃ t r i̯ - ʒ i r -
Portuguese	s i ɣ u r a r	i - ʃ p r ə m - e r -	s ə - r a r -	s i - ɤ a r -	e - p i - r - t a r -	ə ʃ t r i̯ ʒ i r - -
Catalan		ə - s p r e m - ə - -	s ə - r a - -			ə s t r e ɲ ə - - -
Walloon				s ɛ - r e - -		s t r i n g e - - -
Friulian		e - s p r i m - i - -				s t r e n g i - - -
Romanian		- s k - r e m e - - -				s t r i n ɟ e - - -
	ToRub	ToRub-Exfricare	ToRub-Frictare	ToRub-Frictiare	ToWash	ToWipe
Latin	f r i k a r e		f r i k t a r e		l a w a r e	t e r g e r e
French	f ɤ e j e - -		f ɤ o t e - - -		l a v e - -	
Spanish	f r e g a r -		f r o t a r - -	f r i s a r	l a ß a r -	
Italian	f r e g a r e		f r e t t a r e		l a v a r e	t e r ɟ e r e
PortugueseBraz		i ʃ f r i g a r			l e v a r -	
Portuguese		i ʃ f r i ɣ a r			l e v a r -	
Catalan	f r ə g a - -			f r ə s a -	ʎ ə b a - -	
Walloon	f r o j - - -		f ɤ o t e - - -		l a v e - -	
Friulian	f r e - a - -				l a v a - -	
Romanian	f r e k a - -				l a - - -	
	ToWipe-Extergere	ToWipe-Exsucare	ToWipe-Limpidare	ToPull	ToPull-Pulsare	ToPull-Trahere
Latin	e k s t e r g e r e	e k s - u k - a r e	l i m p i d a r e	t i r a r e	p u l s a r e	t r a h e r e
French		e - s ɥ i - j e - -		t i ɤ e - -	p u - s e - -	t ɤ - - ɛ ɤ -
Spanish	e - s t a r s i r -	e n x - u g - a r -	l i m p j - a r -	t i r a r -	p u - x a r -	
Italian		a ʃ ʃ - u g - a r e		t i r a r e	p u l s a r e	t r a r - r e
PortugueseBraz		ẽ - ʃ - u g - a r -	l i̯ - p - - a r -	ʧ i r a - -	p u - ʃ a r -	t r a z e - -
Portuguese		ẽ - ʃ - u ɣ - a r -	l i̯ - p - - a r -	t i r a r -	p u - ʃ a r -	t r ɐ z e r -
Catalan	ə - s t ə r ʒ i - -	ə - ʃ - u g a - - -		t i r a - -		t r e w - r ə
Walloon		- s - u - w e - -		t i r e - -	p u s i - - -	
Friulian		- s - u - j a - -		t i r a - -	p u l s a - -	t r a j - - -
Romanian	- - ʃ t e r ɟ e - -	u - s - - k - a - -			p u l s a - -	t r a ɟ e - -

	ToPush	ToThrow	ToThrow-Lanceare	ToThrow-Eruncare	ToTie	ToTie-Aptare
Latin	i m p i n g e r e	j a k t a : r e	l a n k e a : r e	e : - r u n k a : r e	l i g a : r e	a p t a : r e
French		ʒ ə - t e - -	l ã - s - e - -		l i - e - -	
Spanish		- e - ʃ a r -	l a n θ - a r -	a - r a n k a r -	l e g a r -	a - t a r -
Italian	i m p i n ʒ e r e	ʒ e t t a r e	l a n ʃ a r e -	a r r o n ʃ a r e	l e g a r e	
PortugueseBrazi		ʒ e j t a r - -	l ã - s - a - -			e - t a r -
Portuguese		ʒ e j t a r - -	l ã - s - a r -			e - t a r -
Catalan	ə m p ε n - ə - -	x i t a - - -	λ ə n s - a - -		λ i γ a - -	
Walloon		ʒ ε t e - - -	l a n c - i : - -		l ɔ j i : - -	
Friulian			l a n ʃ a : - - -		l e - a : - -	
Romanian	i m p i n ʒ e - -			a - r u ŋ k a - -	l e g a - -	
	ToSew	ToCount	ToCount-Enumerare	ToSay	ToSay-Exponere	ToSing-AncestralClass
Latin	k o : n - s u e r e	k o m p u t a : r e	e : n u m e r a : r e	d i : k e r e	e k s p o n e r e	k a n t a : r e
French	k u - d - - ʁ -	k ò - - - t e - -	e n u m e ʁ e - -	d i - - ʁ -		ʃ ã - t e - -
Spanish	k o - - s - e r -	k o n - - t a r -	e n u m e r a r -	d e θ i r -		k a n t a r -
Italian	k u - - ʃ - i r e	k o n - - t a r e	e n u m e r a r e	d i - - r e	- - s p o r - r e	k a n t a r e
PortugueseBrazi	k u - - z - e r -	k ò - - - t a r -	e n u m e r a r -	d i z - e r		k ã - t a r -
Portuguese	k u - - z - e r -	k ò - - - t a r -	e n u m e r a r -	d i z - e r		k ã - t a r -
Catalan	k u - - z - i - -	k u m - - t a - -	e n u m e r a - -	d i - - -		k ò n t a - -
Walloon	k ø : - - z - - -	k ò - - - t e - -		d i : - - ʁ -		ʃ ã - t e - -
Friulian	k u - - z i - - -	k o n - - t a : - -		d i : - - -		c a n t a : - -
Romanian	c o a - - s - e - -		- n u m a r a - -	z i ʃ e - -	- - s p u n e - -	k i n t a - -
	ToPlay-Ludere	ToPlay-Jiocare	ToFloat	ToFloat-Flutare	ToFlow	ToFlow-Colare
Latin	l u : d e r e	j o - k a : r e	f l u : k t u a : r e	f l u i t a : r e	f l u e r e	k o : l a : r e
French		ʒ - w - e - -	f l y k t u e - -		f l y e - -	k u l e - -
Spanish	l u d i r -	x u - g a r -	f l u g t w a r -		f l u i r -	k o l a r -
Italian		ʒ o - k a r e	f l u t t u a r e	f l u i t a r e	f l u i r e	k o l a r e
PortugueseBrazi		ʒ o - g a ʁ -	f l u - t u a ʁ -		f l w i ʁ -	k o - a ʁ -
Portuguese		ʒ u - γ a r -	f l u - t u a r -		f l w i r -	k u - a r -
Catalan		ʒ u - g a - -	f l u k t u a - -		f l u i - -	k u ł a - -
Walloon		ʒ u w - e - -				k ɔ l e - -
Friulian		ʒ u j - a : - -				
Romanian		ʒ u - k a - -	f l u c t u a - -			

	ToFlow-Excurrere	ToFlow-Currere	ToFreeze	ToFreeze-Glaciare	ToFreeze-Inglaciare	ToBurn-Brojan
Latin	e k s k u r r e r e	k u r r e r e	g e l a : r e	g l a - k i a : r e	i n g l a k i a : r e	
French		k u - ʁ i ʁ -	ʒ ə l e - -	g l a - s - e - -		b ʁ y l e - -
Spanish	e - s k u r i r - -	k o - r e r -	- e l a r -			
Italian	- - s k o r r e r e	k o r r e r e	ɖ e l a r e	g j a t ʃ j a r e		b r u ʃ a r e
PortugueseBrazi	i - ʃ k o - ʁ e ʁ -	k o - ʁ e ʁ -	ʒ i l a r -			
Portuguese	i - ʃ k u - ʁ e r -	k u - ʁ e r -	ʒ i l a r -			
Catalan	ə - s k o - r ə - -	k o - r ə - -	ʒ ə l a - -	g l ə - s - a - -		
Walloon			ɖ a l e - -			b ʁ u : l e - -
Friulian	- - s k o - r i : - -	k o - r i - -		g l a - ʃ - a : - -		b r u z a : - -
Romanian	- - s k u r ɖ e - -	k u r ɖ e - -			i n g - e t s - a - -	
	ToBurn-Cremare	ToBurn-Flammare	ToBurn-Ardere	ToBurn-Flagrare	ToBurn-Incendere	ToBurn-AncestralClass8
Latin	k r e m a : r e	f l a m m a : r e	a r d e : r e	f l a g r a : r e	i n k e n d - e r e	u s t u l a : r e
French	k ʁ a m e - -	f l ɑ̃ - b e - -	a ʁ d - ʁ -	f l a g ʁ e - -	ẽ - s ɑ̃ - d j e - -	
Spanish	k - e m a r -	f l a - m e a r	a r d e r -	f l a g r a r -	e n θ e n d - e r -	
Italian	k r e m a r e	f j a m m a r e	a r d e r e	f l a g r a r e	i n ʃ ɛ n d j a r e	u s t o l a r e
PortugueseBrazi	k - ɐ j m a r e		a ʁ d e ʁ -	f l a g ʁ a ʁ -	ĩ - s e n ɖ i a r -	
Portuguese	k - ɐ j m a ʁ e		e r d e r -	f l a g r a r -	ĩ - s ẽ - d j a r -	
Catalan	k r ə m a - -	f ł a m a - - -			ə n s e n d - - r ə	
Walloon						
Friulian						
Romanian			a r d e - -		i n ʃ i n d ʒ e - -	u s t u r a - -
	All	All-Totus	Many	Many-Tantus	Some	Few
Latin	o m n e : s	t o : - t u s	m u l t u s	t a n t u s		p a u k u s
French		t u - - -	m u - - -		o - k œ - -	p ø - -
Spanish		t o - d o -	m u - ʃ o -	t a n t o -	a l g u n o	p o k o -
Italian	o ɲ ɲ i -	t u t t o -	m o l t o -	t a n t o -	a l k u n o	p ɔ k o -
PortugueseBrazi		t o - d u -	m ũ ʃ - t u	t ẽ - t u -	a w g ũ - -	p o w k u
Portuguese		t o - ð u -	m ũ ʃ - t u	t ẽ - t u -	a ł g ũ - -	p o w k u
Catalan		t o - t - -	m o l - - -	t a n t - -	ə l g u - -	p ɔ k - -
Walloon		t ə - - -				p ð - -
Friulian		d u - t - -	m o l c - -	t a n c - -		p o : k - -
Romanian		t o - t - -	m u l t - -			

	Other	Other-Alius	Big	Big-Grandem	Big-Majjorem	Long-Longum
Latin	a l t e r -	a l i u s	m a g n u m	g r a n d e m	m a j j o r e m	l o - n g u m
French	o - t - æ -			g ʁ ā - - -		l ô - - - -
Spanish	o - t - r o		m a - n o -	g r a n d e -		l o - n g o -
Italian	a l t - r o		m a n n o -	g r a n d e -		l u - n g o -
PortugueseBrazi	o w t - r u	a w - - -		g r ẽ - ð i -		l ô - g u - -
Portuguese	o w t - r u	a t - - -		g r ẽ - d i -		l ô - g u - -
Catalan	a l t - r ə			g r a n - - -		l o - ŋ - - -
Walloon	ō - t - - -			g ʁ ā - - - -		l ô - - - -
Friulian	a l t - r i			g r a n t - - -		l u n k - - -
Romanian	a l t - - -				m a - - - - r e	l u n g - - -
	Long-Largum	Wide	Wide-Amplum	Heavy	Heavy-Lurdus	Heavy-Pesant
Latin	l a r g u m	l a : t u m	a m p l u m	g r a w i s	l u r d u s	p e : s a n t -
French	l a ʁ ʒ - -	l e - - -	ā - p l - -	g ʁ a v - -	l u ʁ - - -	p ə z ā - - -
Spanish	l a r y o -	l a t o -	a n ʃ - o -	g r a b e -	l e r d o -	p e s a - ð o
Italian	l a r g o -	l a t o -	a m p j o -	g r ε v e -	l o r d o -	p e s a n t e
PortugueseBrazi	l a ʁ g u -	l a t u -	ẽ - ʃ - u -	g r a v i -	l e r d o -	p e z a - d u
Portuguese	l a r g u -	l a t u -	ẽ - ʃ - u -	g r a v i -	l e r d o -	p i z a - ð u
Catalan	l a r k - -		a m p l ə -	g r e w - -		p ə z a - t -
Walloon				g r a v - -		
Friulian	l a r k - -			g r ε v i -		p e z a n t -
Romanian	l a r g - -	l a t - -		g r e w - -		
	Small	Small-Pittinus	Small-Pitulus	Short	Short-Brevis	Narrow
Latin	p i t t i t u s	p i t t i n u s	p i - t u l u s	k u r t u s	b r e w i s	a n g u s t u s
French	p ə - t i - - -			k u ʁ - - -	b ʁ ε f - -	
Spanish		p e - k e n o -		k o r t o -	b r e b e -	a n g o s t o -
Italian		p i t ʃ i n o -	p i k k o l o -	k o r t o -	b r ε v e -	a n g u s t o -
PortugueseBrazi		p e - k e n u -		k u ʁ t u -	b r ε v i -	
Portuguese		p i - k e n u -		k u r t u -	b r ε v i -	
Catalan	p ə t i t - - -			k u r t - -	b r e w - -	
Walloon	p i - t i - - -			k u : ʁ - - -	b ʁ ε f - -	
Friulian			p i - ʃ u l - - -	k u r t - -		
Romanian		p u - t s i n - -				i ŋ g u s t - -

	Narrow-Strictus	Thin	Thin-Delicatus	Thin-Subtilis	Right-Dextrem	Right-Directum
Latin	- s t r - i - k t u s	m i n u - t u s	d e : l i k a : t u s	s u b t i : l e m	d - e k s t r u m	d i : r - e : k t u s
French	e - t ʁ w a - - -	m ə n y - - -	d u : - - ʒ e : - -			d - ʁ w a - t - -
Spanish	e s t r - e - - ʃ o -	m e n u - d o -	d e l - γ a ð o -	s u - t i l - -	d j e - s t r o -	d e r - e - ʃ o -
Italian	- s t r - e - t t o -	m i n u - t o -	d e l i k a t o -	s o t t i l e -	d - ε - s t r o -	d ε s t r a - - -
PortugueseBrazi	i s t r - ej - - t u -	m i - u - d u -	d e w - g a d u -	s u - ʃ i w - -	d - ε - s t r u -	d i r - ej - t e -
Portuguese	i ʃ t r - ej - - t u -	m i - u - ð u -	d ε ʔ - γ a ð u -	s u - ʃ i w - -	d - ε - ʃ t r u -	d i r - ej - t e -
Catalan	ə s t r - ε - - t - -	m ə n u - t - -	d ə l i k a t - -	s u p t i l - -	d - e - s t r ə -	d r ε t - - - -
Walloon	- s t ʁ - ø : - - - -	m i n u - - - -		s u : - t i - - -		d r ø : t - - - -
Friulian	- s t r - ε - - t - -	m i n u : - t - -		s u - t i : l - -		d r ε t - - - -
Romanian	- s t r - i m - t - -	m ə r u n t - -		s u b t s i r e -		d r e p t - - - -
	Red	Red-Russus	Red-Vermiculus	Red-Rubeus	Green	One
Latin	r u b e r -	r u s s u s	v e r m i k u l u s	r u - b e u s	w i r i d e m	u n u m
French		ʁ u - - -	v ε ʁ m ej - - - -	ʁ u - ʒ - - -	v e ʁ - - - -	œ - - -
Spanish		r o - x o -	b e r m e x o - - -	r u - b j o -	b e r - d e -	u n o -
Italian	r u b - r o	r o s s o -	v e r m i ʔ - ʔ o -	r ɔ b b j o -	v e r - d e -	u n o -
PortugueseBrazi		ʁ o - ʃ u -	v e ʁ m e - - ʔ u -	r u - b e o -	v e r - d i -	ũ - - -
Portuguese		ʁ o - ʃ u -	v i r m ej - - ʔ u -	r u - b e o -	v e r - d i -	ũ - - -
Catalan		r o - s - -	b ə r m ε - - ʔ - -	r u - dʒ e - -	v ε r - t - - -	u n - - -
Walloon				r ɔ - ʃ - - -	v ε ʁ - - - -	ō - - -
Friulian		r ɔ - s - -			v ε r - t - - -	u η - - -
Romanian		r o - ʃ u -		r oj - b - - -	v e r - d e -	u n u -
	Two-Duos	Two-Duae	Two-Duas	Three	Four	Five
Latin	d u o : s	d u - aj	d u a s	t r - e : s	k ^w - a t t w o r -	k ^w i : n k ^w - e
French	d - ø -			t ʁ w a -	k - a - t - - ʁ -	s ě - k - -
Spanish	d - o s			t r - e s	k w a - t - - r o	θ i n k - o
Italian		d u - e		t r - e -	k w a t t - - r o	ʃ i η k w e
PortugueseBrazi	d - oj s		d u e s	t r - e s	k w a - t - - r u	s ĩ - k - u
Portuguese	d - oj ʃ		d u e ʃ	t r - e ʃ	k w a - t - - r u	s ĩ - k - u
Catalan	d - o s			t r - ε s	k w a - t - - r ə	s i η k - -
Walloon	d - ø : -			t r - ø : -	k w a - t - - -	s ě - k - -
Friulian	d - oj -			t r - e : -	k w a - t - - r i	ʃ i η k - -
Romanian	d - oj -	d o w ə		t r - ej -	p - a - t - - r u	ʃ i n ʃ - -

	Here	There	There-Ibi	There-Adlbi	Who-Qui	Who-Quem
Latin	- e k k u m h i: k	i l l a: k	i b i:		k ^w - i s	k ^w - e m -
French	i - - s - - i -	- - l a -			k - i -	
Spanish	- a - k - - i -	a - j a -		a i		k j e n -
Italian	- - - k w - - i -	- - l a -	- v i		k - i -	
PortugueseBrazi	- a - k - - - i -	- - l a -		a i		k - ěj - -
Portuguese	- ɐ - k - - - i -	- - l a -		ɐ i		k - ẽj - -
Catalan	- a - k - - - i -	ə - ʎ a -			k - i -	
Walloon		- - l a -			k - i: -	
Friulian	- a - k - - - i -				k w i -	
Romanian		- - l a -				ʃ - i n e
	What	When-Quando	How-Quomodo	Not	Not-Nec	And-Et
Latin	k ^w - i d	k ^w - a n d o:	k ^w o: m o d o	n o: n	n e k	e t
French	k w a -	k - ã - - -	k ɔ m ã - -	n ã -	n i -	e -
Spanish	k - e -	k w a n d o	k o m o - -	n o -	n i -	i -
Italian	k - e -	k w a n d o	k o m e - -	n o n	n e -	e -
PortugueseBrazi	k - i -	k w ẽ - d u	k o m u - -	n ẽw̃ -	n ẽj -	i -
Portuguese	k - i -	k w ẽ - d u	k o m u - -	n ẽw̃ -	n ẽj -	i -
Catalan	k - ɛ -	k w a n - -	k ɔ m - - -	n o -	n i -	i -
Walloon	k w ɛ: -	k w a n d -	k ɔ m ẽ - -		n ẽ -	ɛ -
Friulian	ʃ - e -	k w a n t -	ʃ e m u: t -	n o -		e -
Romanian	ʃ - e -	k - i n d -	k u m - - -	n u -		e -
	And-Si					
Latin	s i: k					
French						
Spanish						
Italian						
PortugueseBrazi						
Portuguese						
Catalan						
Walloon						
Friulian						
Romanian	ɧ i -					

Character Assignments

Each segment gets a different number

1	e	2	g	3	o:	4	ʒ	5	ə	6	j	7	o	8	i	9	w	10	ɔ	11	dʒ	12	ɪ	13	j	14	n	15	s	16	u	17	ʃ	18	oj	19	v
20	b	21	t	22	u:	23	y	24	d	25	f	26	e:	27	m	28	a	29	r	30	ɐ	31	œ	32	ɛ	33	l	34	r	35	x	36	ʎ				
37	ɾ	38	i:	39	ɲ	40	ɔa	41	h	42	ẽj	43	õ	44	ã	45	ĩ	46	ẽ	47	ɸ	48	ɨ	49	p	50	z	51	ð	52	k	53	ts				
54	a:	55	ẽj	56	ɾ	57	aj	58	ɛ:	59	θ	60	ej	61	ɐj	62	õ	63	ɸ	64	ø:	65	c	66	g	67	ɬ	68	ɛj	69	ø	70	ɛa				
71	k ^w	72	ɣ	73	ẽ	74	ɲ	75	g ^w	76	ẽɸ	77	ɑ	78	β	79	ɸ	80	ẽ	81	ɔ:	82	ũ	83	ɭ	84	ç	85	ɑ:	86	ĩ	87	œ				
88	au	89	ɸ	90	ẽw																																

Partition Assignments

Model: “Linguistically Informed”

1 Nasal Vowel

ẽ ĵ ȳ ǎ ĩ ẽ ṽ ĵ ỹ õ ẽ eũ ε û œ v̄ w̄

2 Vowel

e ɔː ə o i ɔ ɪ u oɪ uː y eː a ɐ æ ɛ iː ʊɑː ɪ aː aɪ ɛː eɪ ɐj øː ɛj ø ɛɑː ɑː ɔː ɑː aʊ ʊ

3 Nasal Consonant

n m j η j̃

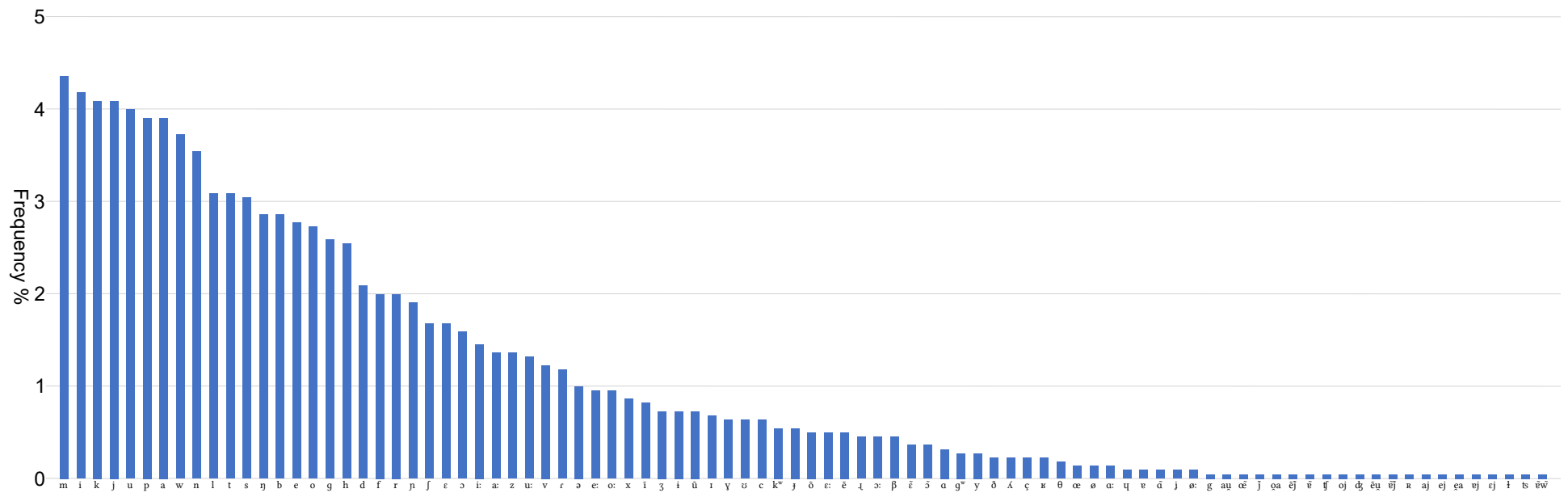
4 Non Sylabic Sonorant

w j l r

5 Consonant

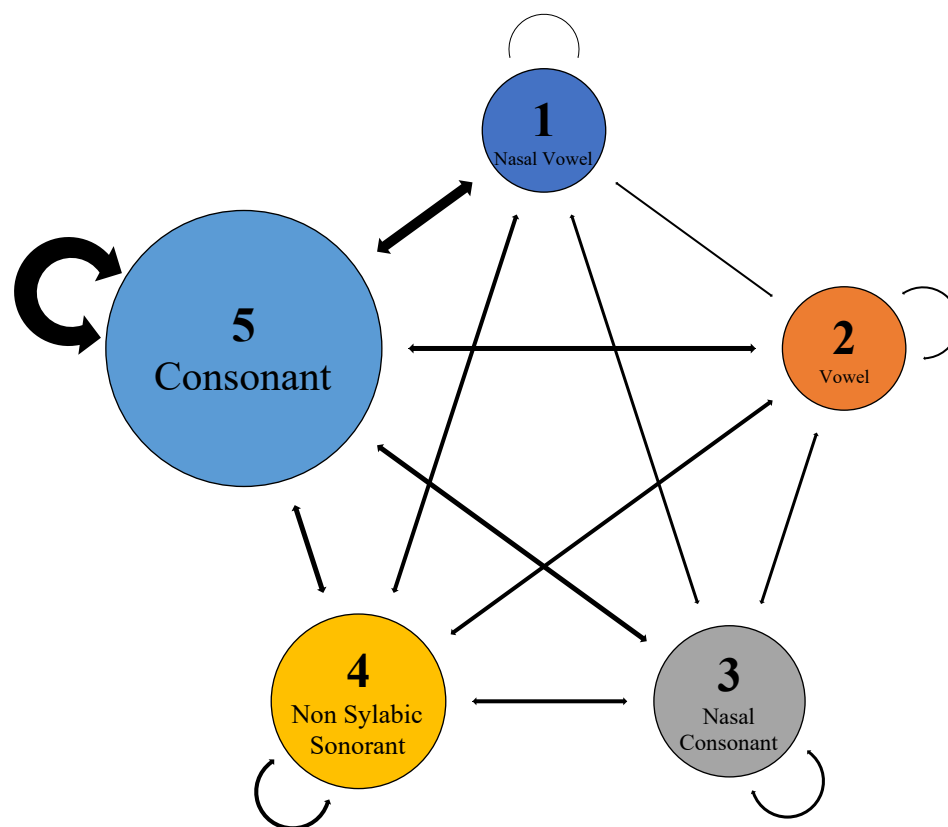
g z j d s f v b t d f r x k h t p z d k t s r t u c g l k^w y g^w b j l c

Prior Segment Frequencies

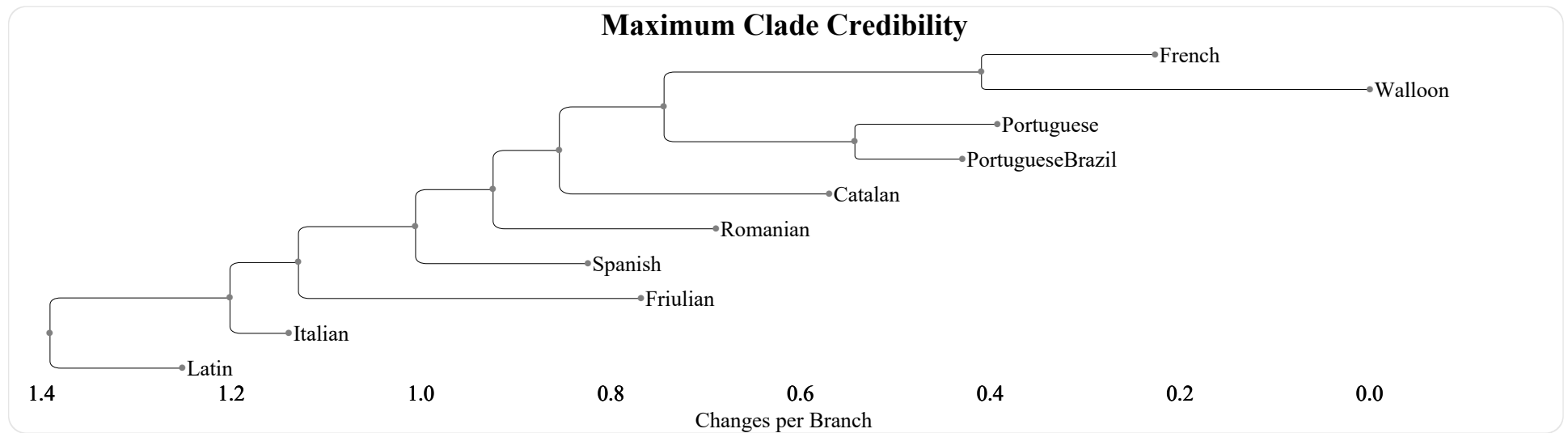


Transition Rates Between Partitions

For the 'Linguistically Informed' model, states were grouped into five sets: Nasal Vowel (1), Vowel (2), Nasal Consonant (3), Non Sylabic Sonorant (4) and Consonant (5). Here, the area of the circles is proportional to the estimated equilibrium frequencies for each group. The width of the arrows is proportional to the estimated rates. Note that rates of change are much greater from one word segment to another when the change is within the word segment group than it is when the change is between word segments in different groups.



Results



Questions

