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	/maːno-/	1
Russian	/rʊka/	2
Polish	/rɛŋka/	2

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

Latin

French

Spanish

Italian

Brazilian Portuguese

117 AD

Credit

Credit

Credit

Credit

Credit

Portuguese

Catalan

Walloon

Friulian

Romanian

Credit

Credit

Credit

Fr3

Fr2

Fr1

Fr1

Credit

Credit

	I	We	YouPlural	YouSingular	YouSingular-VostramMercedem	Woman
Latin	- e g oː	n oː - s -	w oː - s	t uː		f eː - 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 ɾ - a
Italian	i - o	n oː i -	v oː i -	t u		f e m m i - n - a
PortugueseBrazil	- e w	n ɔ j - s	v ɔ j s	t u	v o s - e -	f e - m e - - - ɐ
Portuguese	- e w	n ɔ - ʃ -	v o - ʃ	t u	v ɔ s - e -	f e - m j - - - ɐ
Catalan	ʒ - ɔ		b u - s	t u	v o s t e -	f e - m - b ɾ - a
Walloon	dʒ ɪ -	n o - - -	v o - s	t y		f œ - m - - - - -
Friulian	j - o	n oː - - -	v oː - -	t u		f ɛ - m i - n - ɛ
Romanian	j e w	n oj - - -	v oj - -	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 oː	i n f a n t e m	
French		d a m - - -	- - ɔ m - - - -	- - - �õ - -	ɑ̃ - f ɑ̃ - - - -	
Spanish	m u x - e ɾ - -	d o - - ɲ a	o m - b ɾ e - -		i n f a n t e -	n i ɲ 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
PortugueseBrazil	m u ʎ - e ʁ - -	d o - - n ɐ	o m ẽj - - - - -		ĩ - f ẽ - tʃ i -	n e n ẽj
Portuguese	m u ʎ - e ɾ - -	d o - - n ɐ	ɔ m ẽj - - - - -		ĩ - f ẽ - t ɨ -	n e n ẽj
Catalan	m u ʎ - e - - -	d ɔ - - n ə	- ɔ m ə - - -			n e n -
Walloon		d œ m - - -	- ɔ m - - -		ɛ - f ɑ̃ - - - -	
Friulian	m u - - iː r - -	d ɔ - - n e	- ɔ m - - -			
Romanian	m u - j e r e -	d o̯am - 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 iː t u s	- s p o n s u s	s o k i u s	m aː t r e m
French	e - p u - z - a -		m a ʁ i - - -	e - p u - - - -		m e - ʁ - -
Spanish	e s p o - s a a	m u x - e ɾ -	m a ɾ i ð o -	e s p o - s o -		m a ð ɾ e -
Italian	- s p ɔ - z a a	m o ʎ ʎ e -	m a r i t o -	- s p ɔ - z o -	s ɔ tʃ - o -	m aː d r e -
PortugueseBrazil	i s p o - z a	m u ʎ - e ʁ -	m a ɾ i d u -	i s p o - z u u		m ẽj - - - -
Portuguese	ɨ ʃ p o - z ɐ	m u ʎ - e ɾ -	m ɐ ɾ i ð u -	ɨ ʃ p o - z u -		m ẽj - - - -
Catalan	ə s p ɔ - z ə	m u ʎ - e -	m a ɾ i t - -	ə s p ɔ - s - -		m a - ɾ ə -
Walloon						m e - ʁ - -
Friulian		m u - iː r - -	m a r iː t - -	- s p oː - s - -		m a - r i
Romanian		m u - j e r e	m ə r i t - -		s o ts - - -	

Each segment gets a different number

1 e	2 g	3 oː	4 ʒ	5 ə	6 ɟ	7 o	8 i	9 w	10 ɔ	11 ʤ	12 ɪ	13 j	14 n	15 s	16 u	17 ʃ	18 oj	19 v	20 b
21 t	22 uː	23 y	24 d	25 f	26 eː	27 m	28 a	29 ɾ	30 ɐ	31 œ	32 ɛ	33 l	34 r	35 x	36 ʎ	37 ʁ	38 iː		
39 ɲ	40 o̯a	41 h	42 ẽj̃	43 ɔ̃	44 ɑ̃	45 ĩ	46 ẽ	47 tʃ	48 ɨ	49 p	50 z	51 ð	52 k	53 ts	54 aː	55 ẽj̃	56 ʀ		
57 aj	58 ɛː	59 θ	60 ej	61 ɐj	62 õ	63 ɛ̃	64 ẽw̃	65 ẽ	66 c	67 ɨj	68 β	69 ł	70 ɥ	71 ɨw	72 dz	73 øː			
74 ɔː	75 gʷ	76 ŋ	77 õː	78 ç	79 au̯	80 ø	81 e̯a	82 kʲ	83 ã	84 ɟ	85 ɑ	86 ɣ	87 ɛj	88 kʷ	89 ẽː	90 ẽu̯			
91 ũ	92 ɺ	93 ȷ̃	94 œ̃	95 ʊ															
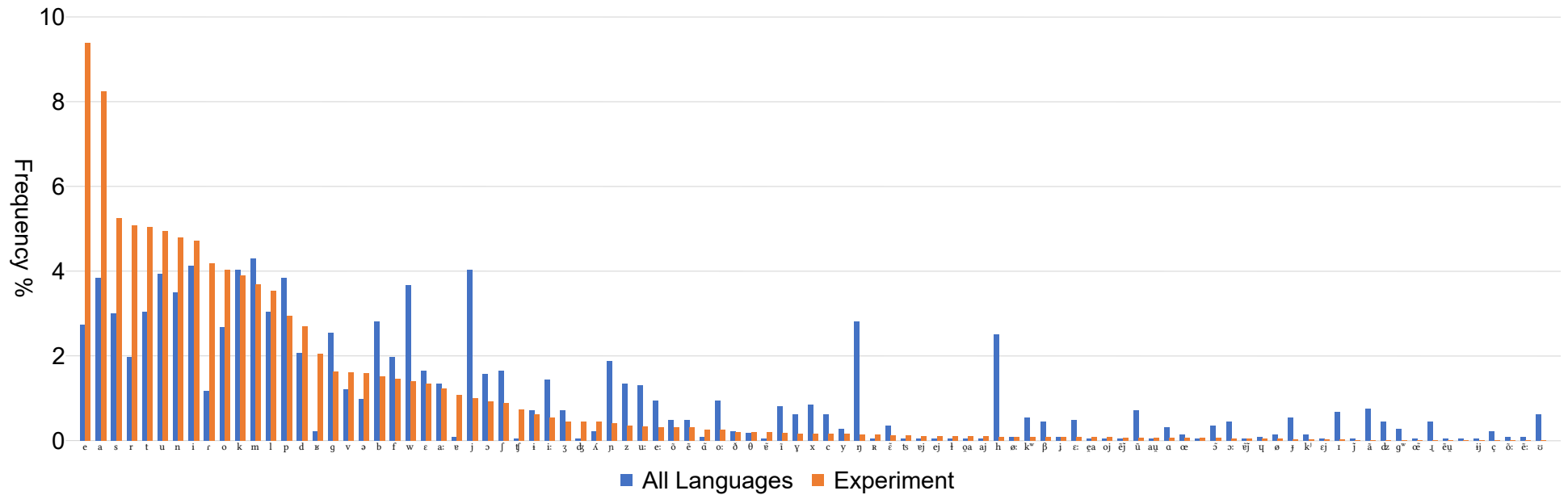
Partition Assignments

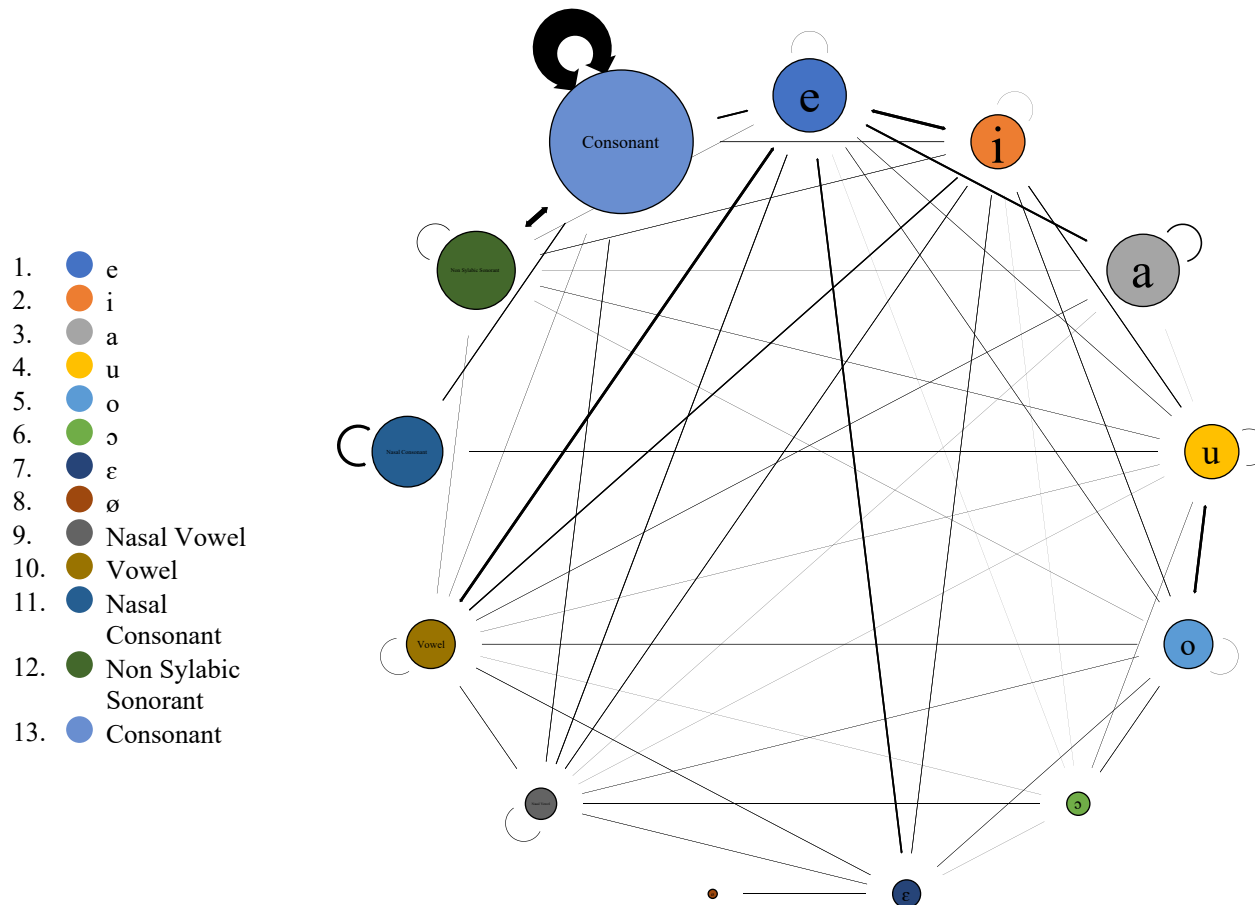Model: "Linguistically Informed"

1) e   e eː

2) i   i iː

3) a   a aː

4) u   u uː

5) o   oː o

6) ɔ   ɔ ɔː

7) ɛ   ɛ ɛː

8) ø   øː ø

9) Nasal Vowel   ẽj̃ ɔ̃ ɑ̃ ĩ ɐ̃ ɐ̃j̃ õ ɛ̃ ɐ̃w̃ ẽ õː ã ẽː ẽṵ ũ œ̃

10) Vowel   ə ɪ oj y ɐ œ o̯a ɨ aj ej ɐj ɨj ɨw au̯ e̯a ɑ ɛj ʊ

11) Nasal Consonant   n m ɲ ŋ ɰ̃

12) Non Sylabic Sonorant   w j l r

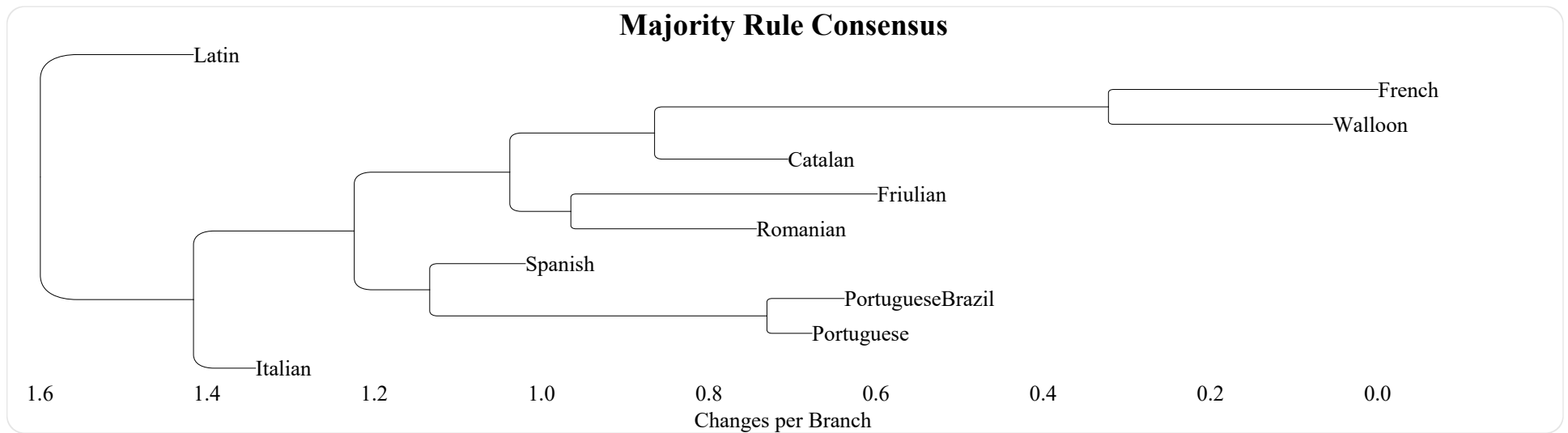13) Consonant   g ʒ ʝ ʤ s ʃ v b t d f ɾ x ʎ ʁ h ʧ p z ð k ts ʀ θ c β ɫ ɥ ʣ gʷ ç kʲ ɟ ɣ kʷ ɻ

For the 'Linguistically Informed' model, states were grouped into 13 sets. Here, the area of the circles is proportional to the occurance frequencies for each group. The width of the lines is proportional to the rates of transition between the each partitions.

1. e
2. i
3. a
4. u
5. o
6. ɔ
7. ɛ
8. ø
9. Nasal Vowel
10. Vowel
11. Nasal Consonant
12. Non Sylabic Sonorant
13. Consonant

Results

Majority Rule Consensus

Questions

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