QUANTIFYING THE COMPARATIVE METHOD: APPLYING COMPUTATIONAL APPROACHES TO THE BALTO-SLAVIC QUESTION

by

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(Under the Direction of Jared S. Klein)

ABSTRACT

Computational methods are slowly being adopted by the historical linguistics community. Their uses are many, from automatic cognate identification to phylogeny reconstruction. Their need is obvious, as more and more linguistic data become available in digital formats. This thesis applies LingPy, a computational toolkit for historical linguists, to data from Baltic and Slavic languages in an exploration of these language groups relationship to each other. Additionally, a new method for cognate identification, ALINE (Kondrak 2009), is integrated into LingPy, using phonetic features in the analysis. Considerable attention is given to the prior scholarship on the Balto-Slavic question and computational methods, to provide a foundation upon which the current analysis is built.

INDEX WORDS: Linguistics, Historical linguistics, Computational linguistics, Baltic languages, Slavic languages, Automatic cognate identification, Language phylogeny

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DEDICATION

To my family, especially my mom and dad, without whose support and love I would not have the opportunities in life I have experienced so far. To my friends, for helping me maintain my sanity.

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CHAPTER 1

INTRODUCTION

1.1 The Comparative Method

The Comparative Method has been a pillar of historical and comparative linguistics for the better part of two-hundred years (for a comprehensive overview of its development, see Lehmann 1993:24-37). Linguists have established genetic relationships among languages through commonly inherited forms, systematically and manually identifying phonetic correspondences in the words of languages. It accounts for similarities that cannot be chance and allows for the reconstruction of proto-languages. However, its use and the interpretation of its results is reliant on expert knowledge of the languages being compared, and the methodologies are often difficult to convey to the general field of linguistics. Moreover, it can be an impossible task to carry out this work by hand for large linguistic corpora, and the process as a whole is dependent on previous documentation and investigation. Consequently, there is a growing interest in applying computational and quantitative methods to this workflow that is the Comparative Method, as part of a larger trend in the field of linguistics. These are regarded as advantageous because of their objectivity, transparency, and replicability of results (List & Moran 2013). This thesis applies these methods to the controversial topic of Balto-Slavic phylogeny, in the pursuit of improving these computational approaches and shedding light on the specific relationships in this area of the Indo-European language family.

Trask (200:64-67) lists three main steps that compose the Comparative Method: 1. establish a genetic relationship; 2. Identify cognate sets through systematic correspondences of

sounds in words of similar meanings; 3. Reconstruct proto-forms from these correspondence sets. This is a much more arduous task than simply identifying words that look similar: whole phonological systems and sound laws are proposed and reconstructed through this. As an example of the Comparative Method, take the following words for 'hundred' in a number of Indo-European languages (Fortson 2004: 131) in Table 1.

Language	Word
Latin	centum
Greek	έκατόν
Tocharian B	kante
Old Irish	cét
Middle Welsh	cant
Gothic	hund
Sanskrit	śatám
Avestan	satəm
Lithuanian	šiñtas
Old Church Slavic	sŭto

Table 1: Indo-European words for 'hundred'

A genetic relationship is established through an exhaustive comparison of the grammar,

phonology, and lexicon of these languages. Mere similarities of form are not enough evidence to establish a relationship, but grammatical correspondences and other anomalies do. Afterwards, a specific comparison of words can take place with the goal of reconstructing a common ancestor form. Sound correspondences in these specific forms are determined, in Table 2.

Latin		c	e	n	t	u	m
Greek	(he)	k	а	1	t	ó	n
Tocharian B		k	а	n	t	e	
Old Irish		с	é	1	t	1	
Middle Welsh		с	a	n	t		
Gothic		h	u	n	d		
Sanskrit		ś	а	1	t	á	m
Avestan		S	а	1	t	P	m
Lithuanian		š	i	ñ	t	а	S
Old Church Slavic		S	ŭ		t	0	

Table 2: Correspondence sets for 'hundred'

Eventually, through this comparison, historical linguists arrived at the proto-form *kmtóm, where each segment of the word represents the correspondence sets of the aligned segments above. This reconstruction does not happen in isolation, as the sound changes that are proposed (e.g. *k>Gk. k, Skt. \acute{s} , etc.) can only be proposed in light of evidence from other comparisons of forms. These sound changes must be seen in other forms. The entire process requires an intimate knowledge of the languages involved, something that can only be gained when looking at large amounts of data from the languages involved. The process as a whole is easy with such a limited data set as the one above but can quickly become overwhelming when hundreds of correspondence sets must be analyzed.

1.2 Improving and Expanding the Comparative Method

While the Comparative Method has been and will continue to be useful, it does have some problems: it is time consuming and requires practiced expertise and explanation. The results are subjective to whoever is doing the reconstruction. Additionally, it assumes the tree model of language evolution (Schleicher 1853). This will be particularly relevant to the discussion of Baltic and Slavic phylogeny that is explored in this thesis. Without a doubt, these two language groups have a strong relationship, but the exact nature of that relationship has been a source of great debate over the last century and a half. The tree model is suitable for expressing the general patterns of language evolution, i.e. vertical inheritance between mother and daughter nodes. It is a useful shorthand to communicate these patterns without much detail. However, it assumes a uniformity of the language varieties involved, is unable to accurately describe dialect continua and fails to convey horizontal interactions between languages, such as lexical borrowing. These notions are important to the question of Balto-Slavic: how these two branches of Indo-European are related cannot fully be explained through a simple bifurcating tree. The evolution of these languages, and all languages in fact, is a much more complicated process.

These problems should be addressed, and computational methods are a possible solution. Quantitative approaches are quickly dominating linguistics, and the subfield of historical and comparative linguistics is not immune to this trend. Within the last few decades, various automatic algorithms have been proposed that handle a step or aspect of the Comparative Method, such as identifying cognates and establishing correspondence sets through phonetic alignment tools that have been used across the field (Kondrak 2000). Many of these methods draw inspiration from other fields or have been lifted wholesale from other disciplines, such as evolutionary biology and phylogeny. Through these modern approaches, we can automate some of the more mundane tasks of the comparative method, while making our experiments and investigations replicable by others in the field. This could prove particularly useful for language groups that are not as well-documented as the Indo-European languages. Additionally, more and more linguistic data in varied forms are becoming readily available thanks to the ease of modern recording and the internet. The languages of today will change and evolve into the languages of tomorrow, and the methods we use will eventually have to analyze corpora in the millions and billions of words. While that scenario is well down the line, it does not hurt to prepare ahead of time, especially when we can still gain insight into previous problems of historical linguistics.

Nevertheless, hiding these improvements behind uninterpretable code and algorithms does not improve the communicability of results that historical linguists should be seeking. The goal is not to replace the handiwork of the Comparative Method but instead to supplement it, allowing us to explore both old and new data in different ways. Like List et al. (2017), I advocate a "computer-assisted framework," rather than a fully-automated one. Ideally, this is an iterative

process, where the data is passed through computers with time in between stages to view the algorithmic findings and edit any mistakes. These methods should not make the process more difficult or obtuse but should be a useful tool in the hands of an expert.

1.3 Outline

The goals of this thesis are twofold: the first is to advocate for the integration of computational methods into historical linguistics and to improve upon them (specifically the LingPy toolkit) as an augment to traditional, manual methods; the second is to describe the phylogenetic network of the Baltic and Slavic languages, determining the relationships shared by the two Indo-European branches through these quantitative approaches.

The rest of the paper will proceed in the following manner. In chapter 2, I present a review of the scholarship surrounding the Balto-Slavic question. The dominant theories of the past hundred years and the evidence for each of them will be discussed. Additionally, the Baltic and Slavic languages as individual entities will be examined as they relate to the problem at hand, considering the evolution of the languages for which we have actual historical records and the ways in which the two branches diverge.

An overview of computational and quantitative methods in historical linguistics follows in chapter 3. The wide-ranging approaches and algorithms that have been proposed, such as tests for genealogical relatedness (Kessler 2001), automatic cognate detection (Steiner et al. 2011), and automatic proto-form reconstruction (Bouchard-Côte et al. 2013), are analyzed before the introduction of the LingPy toolkit that unifies many of these methods into a computer-assisted framework. The key points of this chapter are the advantages of using these approaches in historical linguistics as a supplement to our traditional handiwork of the Comparative Method. Using techniques that the rest of linguistics has embraced improves the communicability and replicability of our results, in addition to making the manual work of highly trained experts easier.

Chapters 4 and 5 present LingPy, an open-source Python toolkit that integrates many of the methods from chapter 3, and the data. Here, the focus is on how the Swadesh lists that comprise the data were gathered and how they must be organized to work with LingPy.

Chapter 6 is a presentation of the preliminary results from LingPy. Here, stock methods are applied to the data without any modifications. This is the first level of discussion, highlighting the benefits of computational methods, but also noting the shortcomings of LingPy.

Chapters 7 and 8 build upon the earlier exploration, by integrating the ALINE algorithm, which uses phonetic features to calculate distance scores, into LingPy and presenting the final results of this expanded approach. While the basic algorithms for automatic cognate detection and proto-form reconstruction included in LingPy are useful, they can be rather heavy-handed and blunt, lacking the finesse of an expert linguist. Consequently, there can be many mistakes in cognate judgments, which can negatively affect other aspects of the framework, such as borrowing detection and phylogenetic reconstruction, thereby yielding inaccurate results. With this new method, we can see whether the implementation of phonetic features, a more detailed way of examining segments, adds anything to the analysis. Here, the computationally derived results are compared to the work done by experts. Additionally, final thoughts on the Balto-Slavic relationship are discussed.

Chapter 9 concludes the analysis, summarizing the main points, highlighting those areas that need further study and continued improvement.

CHAPTER 2

THE BALTO-SLAVIC QUESTION

2.1 The controversy at hand

It is undeniable that Baltic and Slavic languages share a number of innovations, but the exact nature of this relationship has been a source of much controversy and debate within the field. The conception of intermediate stages between Proto-Indo-European and the attested languages of the various daughter branches (German Zwischenursprachen) goes back to the earliest comparative grammars of Indo-European in the 19th century. The existence of an Indo-Iranian group (with a hypothesized Proto-Indo-Iranian language) was proposed from the outset and has never been in doubt. In contrast, the idea of a Proto-Balto-Slavic language has gone through several stages of acceptance and rejection over the last two centuries. Both branches are relative newcomers on the stage of history, with Slavic first appearing in the 9th c. CE, though most of our written records are later copies of these earlier writings, and with no major writings in Baltic appearing until the 16th c. CE. Their late attestation has not helped to clear the debate of a "Balto-Slavic" proto-language. However, we are certain that they are connected in some way, either through a common proto-language or through areal contact. The following sections provide a history of the debate, highlighting the main points on both sides of the argument (For a discussion of the Baltic and Slavic languages used in this experiment, see chapter 4).

2.2 Overview of scholarship

Before the 19th century and the establishment of more scientific comparative grammars, the status of Baltic as an independent branch was called into question: Ostermeyer (1775, 1780),

among others, viewed the Baltic languages as an offshoot of Slavic, with Gothic and Finnish influences. This view did not last very long, however. Bopp's *Vergleichende Grammatik* (1833-1849) presented the Baltic languages alongside the other Indo-European branches, with no particular emphasis placed on a relationship with Slavic in the earlier volumes. Once the independence of Baltic and Slavic was established, the question of their original relationship soon arose. In Bopp's later volumes and his work devoted exclusively to Baltic (1853), he entertains the idea of an original group called *Lettisch-slawisch*, noting that the Baltic languages displayed a closer relationship with Slavic than with any of the other language groups in Indo-European. This can be considered the first coherent expression of a Balto-Slavic hypothesis.

Shortly after Bopp, Schleicher (1861), in his tree model of Indo-European, also grouped the two in one sub-branch, á la Indo-Iranian. This is the classic expression of Balto-Slavic unity, with an intervening stage of *Slawo-litauisch*, or what we would call Proto-Balto-Slavic (additionally, Schleicher proposed that this was an offshoot of *slawodeutsh*, which split into "Germanic" and "Balto-Slavic"). In general, the neogrammarians held to Schleicher's hypothesis. At this time, during the development of the Comparative Method, August Leskien was among those who established the doctrine of *die Ausnahmslosigkeit der Lautgesetze*, i.e. that sound laws are exceptionless, and determined that genetic relationship between languages depended on common innovations shared exclusively by these langauges, rather than archaisms (which prove only that an original relationship existed). This still holds today, as it implies that Balto-Slavic, and really any hypothesis of linguistic relatedness, must be evaluated by comparing the two groups of languages to each other but also against the background of the wider language family, i.e., other Indo-European languages in the case of Balto-Slavic. This allows for the identification of isoglosses shared by the two groups and the detection of which of those isoglosses are innovations rather than archaisms. Thus, any theory of Balto-Slavic must involve at some level a reconstruction of Proto-Indo-European.

Brugmann (1886; 1904: 283 f) also shared this view, using the phrase *der baltisch-slavische Zweig* and talking about a Balto-Slavic community. He supported it with a list of shared innovations, which are enumerated and discussed below. The notion of a unitary Balto-Slavic branch was unchallenged in the latter half of the 19th century, until Antoine Meillet in his book on the Indo-European dialects (1908): Meillet believed that independent innovations were just as likely as a period of Balto-Slavic unity. He claims that the undeniable similarities found in Baltic and Slavic are the result of parallel developments: using the same evidence as Brugmann, Meillet asserts that the parallel changes are linguistically natural and common enough to be caused by chance. Additionally, he maintains that many of these so-called isoglosses extend back to Proto-Indo-European, saying that they are not truly innovations. Supporting all of this is an emphasis on the divergences found between Baltic and Slavic. These assertions are reviewed in section 2.4.

Meillet's hypothesis was the first challenge to the idea of Balto-Slavic. While some scholars still adhered to the traditional view of the 19th century, others tried to reconcile it with Meillet's criticisms. Endezlīns (1911) explored all aspects of the debate in an attempt to redefine Balto-Slavic, accounting for both shared innovations and divergences. He proposed that, even at the time of the Indo-European proto-language, there was a dialectal distinction between Slavic and Baltic: the two speech communities lived close together, forming a secondary speech community. This would explain the number of differences between the two but allow for the acquisition of common features due to contact. Opposed to this is Rozwadowski (1912), who argued for an original, unified speech community of Balto-Slavic. He accounted for the

divergences by positing a point in time in which Baltic and Slavic split apart and no longer had contact. Later on after 1000 CE, there was an era of renewed contact that still exists to this day. Of the two responses to Meillet, Rozwadowski's thesis has garnered little support and has been widely denied since its conception. Nevertheless, Meillet's work and Endzelīns' response created this debate, placing a new emphasis on differences in addition to commonalities.

The next scholar to take up this issue was Reinhold Trautmann, who became one of the principle proponents of the Balto-Slavic hypothesis, systematizing lexical correspondences between the two language groups in his Baltisch Slavisches-Wörterbuch (1923). This work was a direct response to the debate initiated by Meillet. Trautmann collected various lexical items, which, according to him, were a part of the Balto-Slavic lexicon. However, this work has been criticized: Trautmann's evidence of lexemes belonging exclusively to Baltic and Slavic is undermined by the inclusion of tokens that are found in other Indo-European languages as well as those that are attested in only one of either Baltic or Slavic as well as in other branches. While this fell short of successfully supporting the hypothesis, Trautmann was not alone in his defense, with scholars such as Van Wijk (1923), Pisani (1932), and Vaillant (1956) all contributing to the idea of a Balto-Slavic unity. Others still opposed the idea along the same grounds as Meillet, as did Fraenkel in his Die baltischen Sprachen (1950), which treated the Baltic and Slavic relationship as more of a Sprachbund. Erhart (1958) established fourteen features which he claimed disproved the Balto-Slavic theory, employing the same approach as Brugmann (1886), but with opposite results.

At this point in time, the debate consisted of reiterating the points made over the preceding half-century, until Werner Winter (1978) discovered a common phonetic law in Baltic and Slavic, i.e. "Winter's Law." This law is itself controversial, but if one accepts it, it is a strong

argument for a common Balto-Slavic stage. In a somewhat novel approach, Ivanov and Toporov (1958) discussed the Balto-Slavic issue not in terms of a common proto-language but instead posited that the formed a dialect continuum. In their eyes, Slavic seemed less archaic and could be interpreted as an evolution of the more archaic Baltic. While this attracted the attention of many Lithuanian linguists, it is difficult to maintain that Slavic was an offshoot of Baltic, especially since, as Petit (2004:30) points out, Slavic is in many ways more archaic than Baltic, especially in terms of word formation (see Ambrazas 1991). Birnbaum (1970) characterizes the different approaches to the Balto-Slavic question as presenting four different possibilities: 1. A Balto-Slavic proto-language; 2. Balto-Slavic as a linguistic model, with both branches having different starting points; 3. Separate but parallel offshoots of Indo-European; and 4. Convergence through a *Sprachbund*.

Much of this debate was established in the middle of the 20th century, but the work was still ongoing until the turn of the century. Within the last three decades, many other scholars have contributed their own evolving views: Schmid (1992) rejected the idea of Balto-Slavic unity, preferring to describe it as contact between two languages that were already separated. One of his main points is that the parallels between Baltic and Slavic are much more recent than some that are shared by Baltic and Germanic or even Baltic and Balkan languages (causing him to reconstruct a Ponto-Baltic dialectal area within the Indo-European family). Schmid's approach is unique in that it attempts to organize the various isoglosses that Baltic shares with other language groups into distinct chronological layers, beginning with Ponto-Baltic, then Germanic, and finally ending with Slavic. Pohl (1992), using examples such as palatalization and the aspectual systems of both groups narrows down the debate to an areal approach and a typological approach, stipulating that the Baltic that is attested has been filtered through prolonged contact

with Slavic languages. This means that many of the parallels might be the result of contact and borrowing rather than a common origin. This comprises the areal approach, similar to past arguments about parallel development and contact. For the typological approach, Pohl, inspired by the contact between Baltic and the typologically distinct Finno-Ugric languages, compares the potential subgroup of Balto-Slavic to other subgroups in Indo-European, specifically Indo-Iranian. For the latter, we can reconstruct a material and intellectual culture that was shared by both language groups, starting with a common name (IIR **arya*-: Skt. *árya*-, Av. *airiiō*). No such stage of common culture has been reconstructed for Balto-Slavic (nor has there been any archaeological evidence for it: see below). Ultimately, Pohl concludes that the majority of convergences in the two dialects are the result of extended contact rather than a single origin.

While the debate around Balto-Slavic has understandably been a linguistic one, tscholars such as Kostrzewski (1956), Sturms (1960), and Gimbutas (1992) have tried to expand the discussion by integrating archaeological data, and it is important to recognize these contributions. According to Kostrzewski, if a Balto-Slavic community existed, it would have been before the period of 1500 BCE, after which there is no archeological evidence in the area. Sturms also claims that there was no period of unity, claiming that both branches had different starting points and only underwent a secondary merger because of geographic proximity later on. Gimbutas observes that there are similarities in the hydronymy of Baltic and Slavic, but there is no real archaeological support for a common Balto-Slavic period.

There are still numerous other contributions that have been made to this debate, but this overview has just served to highlight the main points concerning Balto-Slavic. Petit (forthcoming) summarizes the evidence, noting that we must allow for the possibility of dialectal variations in our reconstructed proto-languages and that a perfectly uniform speech community is not even a possibility. Linguistic communities are networks that interact with each other in multiple ways. The difficulty in determining the exact nature of the relationship between Baltic and Slavic is the result of the complex parameters of the wider Indo-European reconstruction, the chronological relationship between Baltic and Slavic, and the geographic proximity shared by them. Only against the background of Indo-European reconstruction, something that is in a nearconstant state of flux and renewal, can the isoglosses and common innovations in Baltic and Slavic be judged. The question of chronology is hard to determine, thanks to the relatively late attestations of both branches: the final answers to this debate are lost in the shadows of unrecorded history. Alongside this, the two groups have remained in constant contact since their attestation, making it difficult to determine the difference between shared innovations and borrowings or linguistic interference. Nevertheless, there is a consensus among scholars today that Baltic and Slavic are descended from the same proto-language; however, these protolanguages must not be conceived as perfectly ordered linguistic entities, where there must be a direct correspondence between all aspects of Slavic and Baltic. This is a limitation of the treemodel proposed by Schleicher and reflected in his reconstructions for Indo-European as being free of internal variation. These criticisms have already been levelled against this model and the Comparative Method. In order to give a more accurate picture of the linguistic situation, we must view the languages as representing continua in a network interacting in multiple ways. Many of the computational methods that are used in this thesis (see chapters 3 and 4) seek to highlight this notion.

2.3 Evidence for a common Balto-Slavic stage

With the review of scholarship out of the way, it is time to examine the evidence for and against the Balto-Slavic hypothesis. First, the facts cited by the proponents of the theory are

presented. As discussed briefly above, the Leskien principle, whereby genealogical classification of languages is based on shared innovations, is at play here. To reiterate Meillet (1908), in order for the features discussed here to lend credence to the theory, they must be traceable to the protolanguage and not reflect later stages of innovation, as well as salient enough to rule out parallel development. Brugmann (1897) provides some of the earliest systematized evidence for Balto-Slavic in the form of a list of eight isoglosses shared by both groups:

- outcomes of syllabic resonants **r*, **l*, **n*, and **m* as *ir*, *il*, *in*, and *im* (or sometimes *ur*, *ul*, *un* and *um*)
- 2) lack of geminate consonants
- formation of "definite adjectives" through an agglutinative pronoun *-(*j*)*is:* e.g. Lith.
 gēras 'good' → geràsis 'the good one,' OCS dobrъ 'good'→ dobryi 'the good one'
- 4) transition to *-*io*-stem in the masculine active participles
- 5) influence of *-*i*-stems on consonant stems based on the reanalysis of Acc.sg. *-*m* as *-*in*:
 Lith. *akmenimi*, OCS *kamenьть* < *-*men-i-m*-
- 6) elimination of suppletion in the Indo-European *so-/to- pronoun to only *to-: Lith. tàs, OCS tъ
- 7) dative singular of the 1st person pronoun: Lith. mán, OCS mьně < *men-ei (cf. Lat. mihī, OInd. máhyam < *meg^h(e)i-)
- 8) syncretism of the genitive and ablative cases in favor of the ablative in thematic stems:
 PIE Abl.sg. *-*od* > Gen.sg. Lith. -*o*, OCS -*a*

Petit (forthcoming) compiles a list of many of the other arguments made by additional scholars for Balto-Slavic. Among the pieces of phonological evidence, which are taken from Endzelīns (1911:3-128) are the following:

- Hirt's Law (Hirt 1895): the ictus of a final vowel was retracted if the vowel of the preceding syllable was followed by a tautosyllabic laryngeal, e.g. PIE *d^huh₂-mó-'smoke' > Lith. dúmai, Gen.sg. SCr. dïma
- 2) Winter's Law (Winter 1978): vowels lengthened before original voiced stops, e.g. PIE
 *udreh₂ 'otter' > Lith. údra, Rus. Výdra
- 3) Development of a tone system, as in Lith. boba and SCr. baba 'old woman'
- 4) PIE *eu > *iau (> Baltic *iau, Slavic *iu): Lith. liáudis, OCS ljudije < PIE *h₁leud^h'people.' Old Prussian has some exceptions to this: OP *keuto* 'skin' vs. Lith. *kiáutas*'shell' < *keu-t-.

Most of the morphological evidence has already been highlighted by Brugmann's list, but notably absent from it is the fact that infinitives are formed by an abstract *-*ti*-like suffix, as in Lith. *but* from a suffix in *-*ti*- and OCS *byti* 'to be' from a suffix in *-*tei*-. Petit (2004, forthcoming) notes that syntactic isoglosses are more difficult to determine, due to the late written records of Baltic that were already heavily influenced by some Slavic languages, but there are some that could go back to a common Balto-Slavic stage:

- Use of the genitive as the direct object in negated sentences. However, this is rare in Latvian and nonexistent in Old Prussian
- 2) Double negation (Dini 1997: 126)
- Use of the instrumental as a predicate with verbs of 'being' and 'becoming.' Both Latvian and Old Prussian lost the instrumental case, and Fraenkel (1926) rejects the Balto-Slavic origin of this phenomenon.

The lexical similarities shared by Baltic and Slavic have always been a strong source of evidence, with some even speaking of a shared Balto-Slavic lexicon (see Trautmann 1923, Endzelīns 1911, and Dini 1997). The following are some examples:

- Balto-Slavic *eźeran 'lake' > Lith. ẽžeras, Latv. ezers, OP assaran and OCS jezero, Russ. ozero, SCr. jezero, Pol. jezioro.
- Balto-Slavic *gālvā 'head' > Lith. galvà, Latv. galva, OP galwo and OCS glava, Russ. golova, SCr. gláva, Pol. głowa.
- Balto-Slavic **rankā* 'hand' > Lith. *rankà*, Latv. *rùoka*, OP *rancko* and OCS *rǫka*, Russ. *ruka*, SCr. *rúka*, Pol. *ręka*.
- Balto-Slavic *vārnā 'crow' > Lith. várna, Latv. vãrna, OP warne and OCS vrana, Russ. vorona, SCr. vräna, Pol. wrona.

Additionally, many suffixes are found exclusively in Baltic and Slavic, including the diminutive *-uk- (Lith. *tevùkas* 'little father,' OCS *synъkъ* 'little son') and the agent suffix *-*neik-/-ni(n)k-* (OP *maldenikis*, OCS *mladenьсь* 'child').

2.4 Evidence against a common Balto-Slavic stage

The evidence provided thus far is seen by many scholars to be conclusive. Even for those that do object, the similarities shared by Baltic and Slavic are undoubtedly striking. In order not to be one-sided in this argument, it is still useful to review those counterpoints that have been proposed over the years. Meillet (1908) responded to Brugmann's claims about innovations shared by Baltic and Slavic, claiming that most of the "innovations" were just inherited from Proto-Indo-European or just natural, typological developments. For example, the changes of syllabic resonants to a vowel+resonant and the lack of geminate consonants are trends found in

other Indo-European branches, so it could be that these were simply inherited from Indo-European.

Erhart (1958) provided a list of fourteen divergences between Baltic and Slavic as a counterpoint to Brugmann's assertions. Pohl (1992) reiterates many of these points.

- the first palatalization of velars in Slavic: this phenomenon does not occur in Baltic but seems to be paralleled in Indo-Iranian, perhaps pointing to an innovation further back in Proto-Indo-European dialects: compare OCS *žena*, OInd. *jáni* < PIE *g^wen(e)H₂
- 2) $*\bar{o}$ and $*\bar{a}$ merged in Slavic but remained distinct in Baltic
- Indefinite adjectives in Baltic have pronominal endings, similar to Germanic, but Slavic indefinite adjectives have normal nominal inflection
- Lithuanian comparatives are formed using the archaic *-esnis*, but nothing of the sort is found in Slavic: cf. OCS comparatives in *-ĕjь*
- Differences in word formation, such as agent nouns: -*telb* in Slavic but -*ējas/-tojas* in Baltic
- Numerals 5 to 9 are formed differently, appearing as *-*io* stems in Baltic, but *-*ti* stems in Slavic
- Numerals 11 to 19 in Baltic are strikingly similar to 11 and 12 in Germanic, while Slavic has a different formation
- Differences in verbal formations, such as presents in *-sta-* found in Baltic but not in Slavic
- 9) Sigmatic aorist is still found in Slavic but not in Baltic
- 10) 1st person singular of thematic verbs preserved the Indo-European ending *- \bar{o} in Baltic, whereas Slavic has a nasalized ending in *- \bar{o} -m

- 3rd person ending of thematic verbs is -*a* in Baltic, but Slavic has the long ending -*etъ* or short ending -*e*
- 12) Slavic has participles in -l-, but Baltic does not
- 13) The verbal category of aspect is prominent in Slavic languages but much less so in Baltic
- 14) Many lexical differences, such as different ablaut grades, e.g. Lith. *dienà* < **dei*-n- vs.
 OCS *dьпь* < **di*-n-

Petit (forthcoming) concludes that none of these divergences is enough to rule out a Balto-Slavic stage. At times, Baltic seems more archaic than Slavic, while in other cases the reverse is true. Much of this can be accounted for by assuming recent innovations in one or both branches. Perhaps most problematic are things like the differences in ablaut grades, but that can easily be explained by assuming that Balto-Slavic still had an ablauting paradigm, where one form was generalized in one branch and another form in the other branch.

An additional complication for reconstructing a common stage arises from divergences that are internal to Baltic and Slavic. A common Slavic proto-language is unquestionably reconstructed (see Derksen 2008), but it is less clear-cut for Baltic. Moreover, there are times when the bond between Baltic and Slavic is limited to only a subgroup of the branches. As Stang (1966) noted, there is a special affinity between East Baltic and Slavic, which can be seen in the thematic genitive *- \bar{a} or *- \bar{o} > Lith. -o, OCS -a, for example. Compare this to Old Prussian which has the ending -as. There is even some division in the lexicon: Lith. $akmu\tilde{o}$, Latv. akmensand OCS kamy, Russ. kamenb vs. OP stabis. Nevertheless, there are times, though much rarer, when West Baltic goes with Slavic against East Baltic, such as possessive adjectives built on *mojo-, *tyojo-, *syojo-: OP mais, twais, swais and OCS moi, tvoi, svoi vs. Lith. mainas, tavas, savas. Most of these facts can again be explained by assuming that one sub-branch followed a path of innovation away from the other and hence should not weaken the possibility of Balto-Slavic. What all of these objections tell us is that Balto-Slavic, and truly any language, has internal variation, with effects from dialectal difference perhaps going back to previous linguistic stages. The debate has been ongoing for nearly two centuries, with many of the same ideas surfacing in the arguments. But perhaps even more light can be shed on this complex relation through a novel approach using computational methods.

CHAPTER 3

COMPUTATIONAL METHODS IN HISTORICAL LINGUISTICS

3.1 Overview of different methods

The usefulness of computational and quantitative methods was briefly touched on above. This chapter focuses the conversation on these approaches, describing the underlying algorithms and why they are needed. General linguistics has been quick to adopt statistical methodologies over the past few decades. Historical linguistics, with its rich tradition, has been less enthusiastic, but that is quickly changing. More and more historical linguists are applying the established methods of other fields to their data. Many of these have drawn inspiration, or even been lifted wholesale, from approaches to evolutionary and molecular biology. Evolutionary phylogeny is concerned with the histories of species, genes, and morphological characteristics of organisms. Compare this to the histories of languages, grammatical features, and words. The parallels are rather striking, down to the underlying data structures, sequences of characters, that compose DNA in biology and words in linguistics. Whitfield (2008) gives a recent comparison of the two fields, while Atkinson & Gray (2005) gives a historical perspective on these comparisons. An investigation into the shared methodologies is not the present goal of this thesis, but it is important to note where many of the approaches that are discussed below come from.

The Comparative Method has sufficed for the past two hundred years, due in large part to the rather limited data sets and the lack of computers for the majority of that time. This has changed very rapidly, as more and more data is made available digitally: ancient texts and wordlists are now easily accessible on the internet. This trend will not change, and the methods of historical linguists will eventually have to keep up with the times. Massive amounts of data for modern languages are collected every single day: these corpora of millions and billions of words must eventually be analyzed as languages evolve and change over the coming centuries. We need to refine our approaches to accurately handle these amounts of data. List & Moran (2013) argue that computational approaches are needed because they are more objective, transparent, and easily replicable. McMahon & McMahon (2005) assert that they are much more expedient than the traditional methodology. All of this allows for an easier comparison of results and the process of linguistic reconstruction. In response to this, many scholars have directly applied methods from molecular phylogenetics to linguistic data: Maximum Parsimony algorithms (Gray & Jordan 2000, Holden 2002, Rexova et al. 2006), Maximum Compatibility algorithms (Warnow 1997; Nakhleh, Ringe, and Warnow 2005), Maximum Likelihood and Bayesian approaches (Gray & Atkinson 2003, Dediu 2010, Greenhill et al. 2010). However, rather than strictly adopting the methods of evolutionary biology as a replacement for the Comparative Method, we should seek to augment it with computational methods, translating the different steps of the workflow into a computational toolkit that can easily assist experts in the field. Steiner, Stadler, and Cysouw (2011) outline one such possibility. This thesis adopts the Python toolkit, LingPy, as described in List & Moran (2013). This toolkit is explained in detail below. Before this, it is necessary to explore the various computational methods that are essential for historical linguistics. This serves as an introduction to those unfamiliar with these approaches, while explicating the motivations behind the functions that are applied to the Balto-Slavic data in chapters 5, 6, and 7. This is by no means an exhaustive exploration of the different methods but only seeks to introduce major concepts that need to be addressed in the computational workflow, singling out a few proposed algorithms for a more in-depth analysis.

3.2 Phonetic alignment algorithms

The first computational problem that must be discussed is phonetic alignment. The importance of sequence alignment is readily apparent in biology, where DNA sequences are aligned to establish evolutionary and structural similarities and differences. The goal is to compare sequences of characters. The same is also true in historical linguistics. Through this comparison of sequences that compose words, we can derive cognate sets and ultimately reconstruct proto-forms. Recall the correspondence sets from the example of the Comparative Method in chapter 1 above, repeated here in Table 3.

Latin		с	e	n	t	u	m
Greek	(he)	k	a		t	ó	n
Tocharian B		k	a	n	t	e	
Old Irish		с	é		t		
Middle Welsh		с	a	n	t		
Gothic		h	u	n	d		
Sanskrit		ś	a		t	á	m
Avestan		S	a		t	ə	m
Lithuanian		š	i	ñ	t	a	S
Old Church Slavic		s	ŭ		t	0	

Table 3: Repeated example correspondence sets for 'hundred'

The sound correspondence sets, i.e. each column, are almost exactly like these sequence alignments, though the term is never explicitly used in historical linguistics. However, within the traditional historical workflow, there is no formal method of alignment: the process depends solely on the linguist's understanding of sound changes within the relevant languages to know which segments to compare to each other.

How a linguist chooses to align the segments of words plays an infinitely important role in the rest of the Comparative Method, determining cognate sets and defining sound changes alike. Consequently, automatic approaches need to clearly outline the processes by which alignment occurs, as they will affect the outcomes of all the methods that follow in the computational workflow. This section explores a few proposed algorithms for alignment. In general, they follow two steps: first, corresponding segments are identified, and, second, gap symbols (e.g. a dash --) are inserted as placeholders for non-corresponding segments. A scoring function is generally used to verify the optimal alignment of the sequences. For linguistic data, it is important to modify the scoring functions so that they generate individual scores based on the segments being aligned, since those segments will have varying similarities (List 2012). These functions are often derived from the phonetic features of the segments.

The first of these algorithms were proposed for pairwise sequence alignment (Wagner & Fisher 1974). As with most of these computational methods, historical linguists only recently adopted these, after they have gone through many modifications and refinements in various fields. In pairwise sequence alignment, the optimal alignment of a sequence is built up from the alignment of smaller subsequences. Each segment is compared with each other or a gap. A score is calculated for all subsequence alignments. The highest scoring one is the optimal one, and it allows the score for larger subsequences to be determined. This continues until the optimal alignment for the whole sequence is established (Durbin et al. 2002). Extensions to this basic algorithm include *local alignment*. The default comparison is *global alignment*, where all segments are treated equally. This could lead to a comparison of segments in linguistic data that are not related. Local alignment solves this by only aligning the most similar subsequences, while the rest are ignored. The most common version of this is the Smith-Waterman algorithm (Smith & Waterman 1981). Some algorithms, such as DIALIGN (Morgenstern et al. 1996), do both global and local alignments at the same time for improved results. An example of resulting

Mode	Alignm	ent																
global	GRE	ΕN	Ci	A T	FΙ	S	Η	Н	U	N	Т	Е	R					
giobai	A F	АТ	Ci	A T		-	-	Η	U	Ν	Т	Е	R					
less	GREEN	I CAT	FISH	H	UN	Т	Е	R										
Iocai	I	FAT	CAT	H	UN	Т	Е	R										
DIALICN			G R	E]	ΕN	С	А	Т	F :	I S	5 I	ł	Н	U	Ν	Т	Е	R
DIALIGN	A F	АТ				С	А	Т				-	Н	U	Ν	Т	Е	R

alignments for global, local, and DIALIGN algorithms are given in Figure 1, taken from List (2012).

Figure 1: Examples of different kinds of alignment

However, with linguistic data, we do not always want sequences to be aligned, i.e. when two words are *not* cognates, we do not want to calculate an optimal alignment. Multiple sequence alignments allow for this, able to use *guide-trees*, constructed using cluster algorithms such as UPGMA (Unweighted Pair Group Method with Arithmetic Mean; Sokal & Michener 1958) and Neighbor-Joining (Saitou & Nei 1987) to align more than two sequences at a time. These allow for the comparison of much more data at once, analyzing more data more expediently than the simple pairwise algorithms. To summarize the information up to now, sequences are arranged in a matrix with corresponding segments in the same columns, with gaps filling the spots of non-corresponding segments.

With this understanding, we can now examine one of the specific approaches that have been proposed. One such is the Sound-Class-Based Phonetic Alignment (SCA) method, first described in List (2012), which handles both pairwise and multiple sequence phonetic alignment. In this method, phonetic segments are compared using the concept of sound classes, as first conceived by Dolgopolsky (1964). Rather than depending on numerous phonological features to describe a segment, all sounds are grouped into different types, such that correspondences within a single type are more regular than between types. There were ten original classes: labial obstruents; dental obstruents; sibilants; velar obstruents and dental affricates; labial nasal; other nasals; liquids; labial approximant; palatal approximant; laryngeals and initial velar nasal. List (2012) expands these rather limited categories into twenty-eight different classes to now include vowels and prosodic features such as tone, as can be seen in Table 4.

AUnrounded low vowelsaBLabial fricativesfCDental/alveolar affricatestsDDental fricativesθEUnrounded mid vowelseGVelar and uvular fricativesxHLaryngealshIUnrounded high vowelsiJPalatal approximantj	
BLabial fricativesfCDental/alveolar affricatestsDDental fricativesθEUnrounded mid vowelseGVelar and uvular fricativesxHLaryngealshIUnrounded high vowelsiJPalatal approximantj	
CDental/alveolar affricatestsDDental fricativesθEUnrounded mid vowelseGVelar and uvular fricativesxHLaryngealshIUnrounded high vowelsiJPalatal approximantj	
DDental fricativesθEUnrounded mid vowelseGVelar and uvular fricativesxHLaryngealshIUnrounded high vowelsiJPalatal approximantj	
EUnrounded mid vowelseGVelar and uvular fricativesxHLaryngealshIUnrounded high vowelsiJPalatal approximantj	
GVelar and uvular fricativesxHLaryngealshIUnrounded high vowelsiJPalatal approximantj	
HLaryngealshIUnrounded high vowelsiJPalatal approximantj	
IUnrounded high vowelsiJPalatal approximantj	
J Palatal approximant j	
K Velar and uvular stops k	
L Lateral approximants 1	
M Labial nasal m	
N Nasals n	
O Rounded low vowels Œ	
P Labial stops p	
R Trills, taps, flaps r	
S Sibilants s	
T Dental/alveolar stops t	
U Rounded mid vowels o	
W Labial approximants/fricatives w	
Y High rounded vowels u	
0 Low even tones	
1 Rising tones	
2 Falling tones	
3 Mid even tones	
4 High even tones	
5 Short tones	
6 Complex tones	

Table 4: List of sound classes in SCA
Sound change is then modeled as a transition between classes. The scoring function for this algorithm is derived from the probabilities of these transitions using a directed weighted graph: sound classes that are known to be closely associated are connected by directed edges which reflect the direction of sound change. The similarity score for two segments is then calculated by subtracting the score of one segment to itself from the length of the shortest connecting path between the two segments. Figure 2 gives an example of how this score is calculated along the directed weighted graph.



Figure 2: Example similarity score calculation

These particular paths show the directionality of palatalization of dental and velar stops. The similarity score between dentals stops and the resulting fricatives, for example, is calculated by subtracting the length of the shortest path (4) from the similarity score for a segment to itself (10). If no path exists, then the score is set to zero. Additionally, the SCA method distinguishes between seven prosodic environments: word-initial consonant, word-initial vowel, ascending sonority, sonority peak, descending sonority, word-final consonant, and word-final vowel. It also allows for the alignment of secondary structures, such as syllables, which is especially important for tonal languages. The basic workflow of SCA has four stages: tokenization of the

input data, conversion of segments into sound classes, alignment analysis, and conversion from aligned sound classes to IPA.

There are many other proposed analyses for alignment, including Covington (1996), and Somers (1998). Another alignment algorithm comes from Kondrak (2000). One of the main differences between Kondrak's ALINE and the SCA method is that it uses multivalued phonetic features as devised by Ladefoged (1995), such as [place] and [nasal]. Each of the features is weighted based on salience, e.g. [place] and [manner] being highly salient, with a numeric value assigned to each. Like the SCA, the comparison of segments is based on the notion of similarity, giving large positive scores to pairs of related segments and large negative scores to pairs of unrelated segments, while other algorithms are based on distance functions between phonetic segments, as in Nerbonne and Heeringa (1997). ALINE is somewhat limited in that it only does pairwise sequence alignments. It does allow for local comparison, in addition to global and semiglobal. Prokic et al. (2009) offers another approach to multiple sequence alignment. It is distance-based and builds multiple sequence alignment through the use of an iterative pairwise alignment program. No phonetic features or sound classes are used, essentially defining segments as either vowels or consonants and predefining distances between them.

Phonetic alignment is almost a subconscious process for an expert historical linguist: he or she just knows which sounds correspond in the respective languages because of the intimate knowledge of those languages. Automatic approaches do not have that luxury yet, and the goal is to not inundate the methods with hundreds of parameters that must be set before calculations and analysis can be carried out. Nevertheless, automatic phonetic alignment is a critical piece of the computational workflow, as it feeds directly into the next stage: cognate identification.

3.3 Automatic cognate detection

The identification of cognates shared by languages is the fundamental prerequisite for the Comparative Method. All further analysis, such as the establishment of a genetic phylogeny of the languages involved and the reconstruction of ancestral forms, hinges on the results of cognate identification. Cognates are determined through a combination of systematic sound correspondences, rather than surface phonetics, and semantic similarity shared by words in different languages. These correspondence sets are always defined with respect to the languages being compared rather than in general terms. Thus, they can only be established for individual languages. This is a time-consuming process when done by hand, especially when comparing and analyzing many languages at once. Automatic approaches seek to augment the expertise of linguists by handling more data at once and analyzing it in a more expedient fashion. There have been numerous proposals for automatic cognate detection, including Bergsma & Kondrak (2007), Steiner et al. (2011), and Rama et al. (2013).

Many of these methods determine cognacy through phonetic distances or similarities in phonetic sequences. Again, this will directly depend on the results of the phonetic alignment discussed in the previous section. From the distance or similarity scores of the alignments, normalized scores can be calculated and compared to a predefined threshold score: normalized scores above the threshold indicate cognacy. Once cognacy status is determined, words are assigned to cognate sets. Some methods use a binary presence/absence pattern (PAP) where '1' indicates a cognate and '0' not a cognate. Others use the STARLING approach (Starostin 2000), where each cognate set is assigned a cognate ID and words within that set share the same ID. Once cognate sets are evaluated, other computational calculations can be carried out, as is shown in the following section. However, while many methods have been proposed, only a handful can do the type of work that we are asking them to do, such as handling more than two languages at

once. Additionally, the source code for most of them is unavailable on the internet. This limits the options for analysis in this thesis. Nevertheless, there are several useful algorithms that can still be used. In this section, four specific methods are compared in detail, highlighting the successes and shortcomings of each.

The first one was formulated in Turchin et al. (2010). It is generally referred to as the Turchin method, or the Consonant Class Matching approach. Similar to the SCA above, the Turchin method uses Dolgopolsky's sound classes. Again, the idea is that certain sounds occur more frequently in correspondence relations than others. Vowels are all treated as one class. The general threshold for cognacy is that the first two consonant classes match. This is purposefully conservative, minimizing the possibility of false positives (i.e. false cognate sets that can lead to wrong conclusions about languages' relationships). Once cognate sets are established, a measure of similarity between two languages can be computed by looking at the proportion of words that are cognates across both languages, giving the attested cognacy proportion. This is then compared to the cognacy proportion of randomized selections of words from both languages' lists: the smaller this estimated proportion is, the more likely the observed cognacy proportion is not due to chance. This is a computationally simple and expedient method with some major drawbacks. It will lead to false negatives, as systematic sound correspondences cannot be captured when they go across consonant classes. Additionally, information that might be contained in vowels or in consonants beyond the first two is not taken into account.

A second approach is the Normalized Edit Distance (NED) method (Holman et al. 2011). This is a direct application of normalized Levenshtein distances (Levenshtein 1965) that have been used in informatics and computer science to measure the difference between sequences. At its basis, it counts the minimum number of insertions, deletions, and substitutions ("edits") that are required to transform a word into another one. For example, identical words would have an edit distance of 0. This measurement of similarity is not subject to phonological plausibility. The raw edit distances are normalized by dividing them by the number of symbols of the longer of the two compared words. This is done for all word pairs in a particular meaning slot, which are then clustered into cognate sets using a flat version of the Unweighted Pair Group Method with Arithmetic Mean (UPGMA) algorithm (Sokal & Michener 1958). Clustering algorithms in general group items that are as similar as possible into clusters. Items in one cluster should be as different as possible from those in another cluster. Since we are working with words from different languages, these clusters will be cognate sets. UPGMA uses the edit distances between word pairs to group the words into cognate sets, terminating whenever a predefined threshold has been reached.

A third method is a combination of the NED method and the Sound-Class Based Alignment discussed in the previous section (List 2014). UPGMA clustering is used here as in NED, but the distance scores are computed using the alignment method. Similar to the Turchin method, sound classes are the basis for comparison, though it does use the expanded version from List (2012a). The distance scores are calculated as described for the alignment algorithm above. It also uses a predetermined threshold for the distance scores as the terminating point of the algorithm, grouping all the compared words that fall under this threshold into a cognate cluster.

A final method is the LexStat method (List 2012b). We can summarize LexStat in four different steps: 1) conversion of input sequences to sound classes, 2) creation of language-specific scoring schemes, 3) computation of pairwise distances between all word pairs, and 4) clustering of sequences into cognate sets. Unlike NED and SCA, a language-specific scoring

scheme is utilized to determine cognacy through a distribution of sound correspondence frequencies. Similar to the Turchin method, LexStat uses a permutation method (Kessler 2001) comparing the attested distribution of cognacy gathered during alignment to an expected distribution. This is derived from a Monte-Carlo permutation of the data, i.e. repeated randomized sampling: wordlists of all language pairs are shuffled so that words of different meanings are aligned and scored. This is then converted into a language-specific scoring scheme for each language pair, using the formula in Figure 3.

$$s_{x,y} = \frac{1}{r_1 + r_2} \left(r_1 \log_2 \left(\frac{a_{x,y}^2}{e_{x,y}^2} \right) + r_2 d_{x,y} \right)$$

Figure 3: LexStat's language-specific scoring scheme

x,y represents a residue pair, i.e. the segments that are aligned together. $e_{x,y}$ is the expected frequency distribution, and $a_{x,y}$ the attested one. r_1 and r_2 are scaling factors, and $d_{x,y}$ is the original similarity score from alignment used to calculate the distributions. This formula draws from the work of Kessler (2001:150) in linguistics and Henikoff & Henikoff (1992) in evolutionary biology. From the language-specific scores, distances between all words are calculated, using traditional algorithms for pairwise sequence alignments (Gusfield 1997). These similarity scores are converted to distances scores following Downey et al. (2008) Finally, like with NED and SCA, cognate sets are created using a flat cluster variant of the UPGMA algorithm. Again, this algorithm terminates when a predefined threshold for average distance scores has been reached.

All four of these methods were evaluated in List et al. (2017). All were used to analyze certain datasets with the results being compared to a gold standard of cognate judgments by linguists. Additionally, a new method, Infomap, that integrates the idea of networks from

evolutionary biology and studies on social networks (Rosvall & Bergstrom 2008; Girvan & Newman 2002), was assessed. Threshold values were calculated for each method using test data: each method was run using distance thresholds ranging from 0.05 to 0.95. The optimal thresholds were found to be 0.75 for NED, 0.45 for SCA, and 0.60 for LexStat. B-cubed scores (Amigo et al. 2009) were used to evaluate the precision, recall, and F-score for each method. A high precision score means a low number of false cognates, and a high recall score means a low number of undetected cognates. Unsurprisingly, the conservative Turchin method had a low number of false positives, but was unable to detect a large number of cognate sets. NED had a higher detection rate, but suffered from too many false positives. SCA outperformed both of those, and the language-specific approaches of LexStat and the newly introduced Infomap performed the best.

Methods for cognate identification are still undergoing refinement every day. There are a number of tasks for the future that need to be addressed. Needing predefined thresholds is inelegant and can lead to guesswork when it comes to initially defining the parameters for the calculations. Most algorithms cannot search for cognates across different meaning values in the input. We know that words can change their meanings in addition to their sounds, and computational methods must be able to account for these changes, as well. Moreover, algorithms for partial cognate detection have been very limited so far (List et al. 2016). All of these algorithms described are strict in that they only group cognates that share all morphemes. Expert linguists are not limited by these restrictions in the algorithms: they are able to freely think and apply their knowledge of the languages, not limited by parameters. These shortcomings need to be fixed, as cognate identification is another important step in the computational workflow. The methods in the subsequent sections all depend on its results. If the cognate judgments are wrong,

then all of the following results will be skewed. That is why it is impossible to eliminate the value of expert linguists in this process. Computational approaches are a valuable tool that experts can use to augment and aid their manual explorations of data in an iterative workflow between computer and linguist.

3.4 Automatic proto-form reconstruction

The ultimate goal of the Comparative Method is to reconstruct ancestral forms of related languages, further exploring their genetic relationship. This has proven to be a difficult task over the years, requiring an all-encompassing knowledge of language change. Most of these proto-forms that are reconstructed are unattested, only being proposed forms that would have likely led to attested daughter forms. While this is a demanding task, it becomes nearly impossible to do by hand for language families that are not as well documented as ones like Indo-European or for language families that have enormous amounts of data, such as Austronesian with its more than 1,200 languages (Lynch 2003). Consequently, automatic approaches could prove useful as an introductory analysis of new data. Unfortunately, not much work has been done to create an accurate method for reconstruction. Contrast this with the numerous proposals for alignment and cognate detection: those are both important steps in the historical workflow, but the outputs of those algorithms, like cognate sets, could and should be used to do even more exciting data explorations, like reconstructions.

A quick-and-dirty method some alignment and cognate detection algorithms have utilized is the idea of consensus reconstructions. These simple reconstructions involve taking the alignment of all sequences in a cognate set and selecting whatever segment is most frequent in each position. This obviously lacks any of the finesse of the Comparative Method, and the results show it: the reconstructions hardly resemble anything that a linguist would actually propose. The fact that few have offered up any alternative methods illustrates how difficult a task it is to do automatic reconstructions. That is because sound changes are not always the straightforward transitions of one sound to another over time. They often are context sensitive, dependent on the neighboring segments. Moreover, they can involve the insertion or deletion of segments. Some have tried to tackle this task, such as Kondrak (2002) and Oakes (2000), but the most successful has been Bouchard-Cote et al. (2013). They propose a system for large-scale reconstruction based on a probabilistic model of sound change at the level of phonemes. As with reconstruction in the Comparative Method, this system is dependent on cognate sets, which can be provided by the output of another algorithm or calculated within this system. It is assumed that each word evolves along the branches of a phylogenetic tree that represents the respective languages' relationships. From the cognate sets, a Monte-Carlo inference algorithm is employed to do the reconstructions. The changes that a phoneme could have undergone are calculated using a context-dependent probabilistic string transducer (Holmes 2001). A transducer is simply a model for computational analysis that has an input and an output. Finite state transducers have been widely used in machine translations (Knight & May 2009) and modeling phonological rules (Kaplan & Kay 1994). This transducer encodes all possible sound changes for a given phoneme as it changes over time. It is able to capture regular sound changes but not irregular ones, such as metathesis. The probabilities for a given change are context-sensitive.

This is a very complex system, one that this thesis is unable to fully explore. It has "literally millions of parameters to set" (Bouchard-Cote et al. 2013: 4225). Fortunately, the system learns them automatically, using a variation of the expectation-maximization algorithm (Dempster et al. 1977): this produces reconstructions under the current parameter settings and updates those settings based on the reconstructions. The system is only as good as its results, however. As a test, it was applied to 637 Austronesian languages. Over 85% of its reconstructions were within one character of the gold-standard reconstructions provided by experts. This is a big improvement over other methods, but it still shows how far we have to go in order to adequately carry out automatic reconstructions.

3.5 Phylogenetic reconstruction and other methods

The most important computational methods that mimic the steps of the Comparative Method have already been described above, but the output of these steps can still give us valuable analyses. Phylogenetic reconstruction is one such computational approach. This is different from the reconstructions discussed in the previous section. The reconstruction is not for words but for the relationships shared by languages: it creates a family tree, with modern daughter languages being the leaves and the nodes on the branches being ancestral states. Steiner et al. (2011) offers several different methods for reconstructing phylogenies in their holistic computational workflow. The relationships between languages are first quantified through the outcomes of alignment and cognate identification. Distances between all of the languages must be computed from this data. One possibility is to calculate the total similarity score of all cognate pairs between two languages, i.e. the number of cognates two languages share. These distance calculations are then input into a clustering algorithm, such as Neighbor-joining (Saitou and Nei 1987) or UPGMA, to construct a phylogenetic tree. An example of the results can be seen in the reconstructed tree for the Tsezic languages in Figure 4, taken from Steiner et al. (2011).



Figure 4: Reconstructed bifurcating tree for Tsezic languages There are other applications for language phylogenies, though. Bouckaert et al. (2012) use Bayesian phylogeographic approaches (Lemey et al. 2009) to analyze vocabulary lists from Indo-European languages and map the geographic expansion of languages. Language evolution was modeled as the gain and loss of cognates over time. The phylogenetic data taken from the cognate sets was combined with spatial diffusion algorithms to place the expansion of languages onto longitude and latitude coordinates on a map. Holman et al. (2011) combined phylogenetic inferences with measure of lexical similarity to calculate the elapsed time since parent languages diverged into daughter languages. However, it utilizes Levenshtein edit distances (similar to the NED method for cognate identification) rather than percentages of shared cognates to determine lexical similarity.

The shortcomings of phylogenetic trees have already been discussed in the introduction to the Comparative Method. With these computational approaches, we do not want to be similarly handicapped. Common inheritance of forms is not the only way in which languages interact. There is language contact, which can lead to horizontal interactions like lexical borrowing. Nelson-Sathi et al. (2010) propose a novel way to analyze hidden borrowings in language networks using cognate sets and phylogenetic data. Borrowing can be seen as comparable to gene transfer in biology, and, indeed, this is the inspiration for the proposed algorithms. The goal is to capture both the vertical and horizontal relationships of language evolution. They adopt the minimal lateral network (MLN) approach from biology (Dagan et al. 2008) to this linguistic data. The algorithm searches for cognate sets that are not compatible with a reference tree phylogeny. These cognates often point to lexical borrowings. The reference trees are inferred through a Bayesian approach (Gray & Atkinson 2003). The results of borrowing are dependent on the input of cognate judgments. This shows how important these judgments are to the rest of the workflow, as incorrect cognate sets will undoubtedly skew the results of this network analysis. The network that results from the MLN approach can be visualized, showing both vertical and horizontal relationships, as in the preliminary results for Indo-European languages in Figure 5.



Figure 5: Reconstructed network for Indo-European languages

The bold white lines make up the reference tree. Each point where they split is a vertex, representing an ancestral state. Borrowing is modeled to occur both at the end nodes (i.e. the

attest daughter languages) as well as at the interior vertices. Based on the distribution of cognates across the reference tree, the model interprets those cognates that do not fit as being borrowed. Borrowing, as well as vertical inheritance, are both represented by the lines, or edges. These are the different interactions between the vertices.

3.6 Summary

Many computational methods have been proposed over the last two decades, as linguistics becomes more and more influenced by the approaches of other fields. The usefulness of these is undoubted: they open up new avenues with which we can explore both new and old date alike. Their shortcomings are still very much a reality. It must be reiterated that these methods will never be able to replace expert knowledge. But this does not mean we should not give them up; they should continue to be refined and improved, as more and more linguistic data becomes digitally available, waiting to be analyzed. They are a valuable tool that can aid the efforts of any linguist. This thesis uses many of the above methods, advocating for their use in a historical workflow based on the Comparative Method.

CHAPTER 4 LINGPY

4.1 Introduction to LingPy

The previous chapter served as an introduction and overview of the different computational methods that have been proposed in recent years. How these various algorithms are analogous to aspects of the Comparative Method does not need to be repeated. They have varying degrees of success and some shortcomings, to be sure. However, the biggest drawbacks to many of these methods are their disjointed nature and their lack of readily available source code.

All of these methods were developed independently of one another. While they all share the same goal of reproducing the accuracy and precision of the Comparative Method when applied to historical data, they have not been designed to interact with one another. For example, Kondrak's (2000) ALINE algorithm can be used to align the segments of multiple sequences, but this does not feed into another method for cognate identification, such as LexStat. The two methods use different standards, i.e. distinctive features vs. sound classes, and were never intended to work together. This makes the aspiration of reproducing the Comparative Method's workflow in computational form all the more difficult. Of course, there is no hope of doing this if the methodologies are not replicable. Replicability is supposedly one of the advantages for these computational methods. This can never be achieved if the source code and underlying approaches are not accessible to other linguists. In their survey of automatic approaches to cognate identification, List et al. (2017) found that only two methods out of twelve were freely accessible on the internet. This is unacceptable if we hope to improve these techniques.

There is a possible solution: LingPy (List & Forkel 2016). Although far from perfect, LingPy is an open source Python toolkit, integrating many of the different methods reviewed in the previous chapter into a single workflow. As with the disparate algorithms that have already been proposed, LingPy's goal is to mimic the different steps of the Comparative Method, in order to achieve the same level of success as the traditional methodology. The basic workflow is summarized in Figure 6 from List & Moran (2013) and is examined in more detail below



Figure 6: LingPy's workflow

Wordlist

The process begins with the raw input data of wordlists. The formatting of this data is quite flexible: it requires only a tab-delimited text file divided into columns. Each wordlist should contain at least four separate columns: 1) ID, integers that simply identify the rows, 2) CONCEPT, glosses for each word, 3) WORD/IPA, the orthographic representation of words, either in IPA or some other orthography, and 4) LANGUAGE, the name of the languages in which the words occur. The header of each column indicates the values contained in that column. The columns can be ordered in any specific way, and there is no limit to the number of rows. Within LingPy, specific data entries are easily found through simple functions, and it is just as straightforward to add new entries. Additionally, the output format is very similar to this, just with new data and calculations added in further columns. An example of this formatting can be seen in Figure 7, which shows the for basic columns and an additional column for tokenized IPA.

# DATA						
ID	CONCEPT	IPA	DOCULECT	TOKENS		
#						
1540	I	as	Bulgarian	a s		
1541	I	ja	Russian	jа		
1542	I	ja	Polish	jа		
1543	I	ja:	Czech	ja:		
1544	I	as	Old Prussian	a s		
1545	I	es	Latvian	e s		
1546	I	e∫	Lithuanian	e∫		
1547	I	jâ:	Serbo-Croatian		j	â:
1548	I	azŭ	Old Church Slav	ic	a	zŬ
#						

Figure 7: LingPy's wordlist format

Once the input data is loaded, it needs to be tokenized. Tokenization of the words allows for them to be compared across orthographies. Ideally, all input data will be in the same orthography or transcription style, but this is still a necessary step in the LingPy workflow, as it feeds directly into alignment. LingPy's parser normalizes all input strings into Unicode. This is output with a space in between each grapheme. The results of tokenization can be seen at the far right of the previous figure.

After tokenization occurs, phonetic alignment can take place. The necessity of alignment has already been discussed. LingPy offers many different approaches to phonetic alignment, both pairwise and multiple. Some have been taken directly from evolutionary biology with some linguistic modifications, such as the Needleman-Wunsch algorithm (Needleman & Wunsch 1970) and the Smith-Waterman algorithm (Smith & Waterman 1981). Of the algorithms overviewed in the previous chapter, LingPy offers the SCA method, with the option of using different models for the analysis. These models are the criteria by which the sequences are aligned, e.g. the sound classes of Dolgopolsky. New models are easily programmed into LingPy.

Next come the different approaches to cognate detection. Again, the goal of these automatic methods is to objectify phylogenetic reconstruction, making the results of the process much easier for non-experts to interpret. There are five different methods implemented into LingPy's workflow. These are the same methods that were evaluated in List et al. (2017): the Turchin, NED, SCA, LexStat, and Infomap methods. LingPy follows the STARLING approach to cognate identification, (Starostin 2000), where cognate words are assigned the same cognate identification number. Once a cognate analysis is completed, the results can be output to a new file that can be further manipulated by hand. This is important for achieving an iterative workflow between the computer and the linguist, as it allows an expert to refine the results and correct any mistakes that might have occurred in the automatic analysis.

Once cognate sets have been identified, other analyses can be carried out, such as automatic reconstruction. At the moment, LingPy does not boast a complex method for reconstruction like Bouchard-Cote et al. (2013). Instead, it only offers quick-and-dirty consensus reconstructions. For a given cognate set, consensus strings are calculated from the alignments. The most frequent segments are chosen for each position. These are not meant to be comparable to expert reconstructions, as they are typically multiple edit operations away from them. These must instead be thought of as preliminary reconstructions, an initial exploration of the data to which linguists can make the necessary adjustments.

Additionally, LingPy offers a number of ways to explore the phylogeny of the languages from the cognate sets. It integrates both Neighbor-joining and UPGMA algorithms for phylogeny. Here the distance matrices between languages are the number of shared cognates: Those with more cognates are more closely related. This outputs a simple Newick tree format, e.g. ((A,B),(C,(D,E)));, which can be visualized by a number of different software, with the results in Figure 8.



Figure 8: Tree generated from Newick format

LingPy also incorporates the minimal lateral network from Neslon-Sathi et al. (2011) to automatically detect lexical borrowing. From the identified cognate sets, borrowing relationships are inferred based on incompatible cognate sets. These cognate sets are deemed incompatible if they do not comply with a given reference tree typology. Thus, in the tree above, if Language E shares a cognate with Language A, but neither Languages C or D share that cognate, borrowing of that lexical item would likely have happened. There is, of course, a certain level of unpredictability when it comes to the retention and loss of lexical items by languages over time. Some of the supposed borrowings very well could have existed in the lexicon at one point in time and have been lost as a language evolves. Nevertheless, the goal is to capture the different kinds of interactions that languages can have.

LingPy's output formats are perhaps its greatest strength. It has already been pointed out how the output text files for cognate identification and reconstructions are easily edited after the fact. Additionally, within LingPy's framework, there are a number of different data visualizations at one's disposal that can be augmented with third-party tools such as MrBayes (Ronquist & Huelsenbeck 2003). Figure 9, a visualization of the Dogon languages of Africa from List & Moran (2013), was created using the built-in functions of LingPy, displaying the same language network of inheritance and borrowing relationships that were described in Nelson-Sathi et al. (2011).



Figure 9: Reconstructed network for Dogon languages

Having these different visualization techniques available is an indispensible asset, as it furthers the goal of increased communicability of the results. Indeed, communicating and objectifying the results of analyses is the goal of LingPy and other computational methods. Making the data results quantifiable allows for easier comparisons across studies. Although there are many shortcomings, as is demonstrated below, LingPy is a tremendous step in the right direction, one that must continue to be improved.

CHAPTER 5 DATA

The discussion of Balto-Slavic has so far been framed around the prehistory of these languages, how exactly they are related and whether there was a stage of common development. However, since there are no direct attestations of this proto-language, we must use the daughter languages as our source of data. As such, it would be useful to provide a brief overview of these two branches, independent of any notion of a formerly unified speech community of Balto-Slavic.

5.1 Slavic languages

The first attestations of Slavic as a distinct branch of Indo-European come from the ninth century, relatively late among the Indo-European languages. It was undoubtedly spoken well before this but was not written until the invention of the Glagolitic and Cyrillic alphabets. Slavic, along with Baltic, is noted for its conservative phonology and morphology, especially in the nominals, although the rate of change has picked up in recent centuries. The palatalization of velars before front vowels is thought to be the last sound change that affected all of Proto-Slavic (Nichols forthcoming). The dialects of Common Slavic began to evolve into distinct languages sometime in the 900s CE, marking the end of the more unified Slavic speech community. Old Church Slavic (OCS) is the earliest written Slavic language, retaining many of the features that are posited for Proto-Slavic. Though it does not belong to a particular branch of Slavic, it has a decidedly West and South Slavic flavor, specifically Bulgarian (Nichols forthcoming).

The other Slavic languages that later arose are typically divided into three main branches: East, West, and South. The East Slavic languages are Russian, Belarusian, Rusyn, and Ukrainian. The West Slavic languages are divided into three sub-branches: Lekhitic, consisting of Polish and Kashubian, as well as the extinct varieties of Polabian and Pomeranian; Sorbian, with Upper and Lower Sorbian; and Czecho-Slovak, comprised by Czech and Slovak. South Slavic languages are divided into Western and Eastern varieties. The Western group contains Slovenian and Serbo-Croatian, which, for a myriad of political reasons, is often split into Bosnian, Croatian, Montenegrin, and Serbian. The Eastern group consists of Bulgarian and Macedonian. Table 5 gives a summary of these divisions with the living modern languages.

Slavic Branch	Sub-branch	Language
East		Russian
		Belarusian
		Rusyn
		Ukrainian
West	Lekhitic	Polish
		Kashubian
	Sorbian	Lower Sorbian
		Upper Sorbian
	Czecho-Slovak	Czech
		Slovak
South	Eastern	Bulgarian
		Macedonian
	Western	Slovenian
		Serbo-Croatian

Table 5: Branches of Slavic

There were intermediate stages of these languages, such as Old Czech, Old Russian, and Old Polish. In this Medieval period, the Slavic languages underwent numerous changes, both phonological and morphological, such as the fall of the jers and the simplification of the verbal tense system (For an overview of these changes, see Nichols forthcoming). These modern languages, along with the older OCS, comprise the Slavic data that is input into LingPy

5.2 Baltic Languages

Slavic is only half of the story: the Baltic languages tell the rest. The Baltic branch shows up in history even later than Slavic, with texts appearing only after the 1200's CE, with the majority of written attestations materializing after the 16th century. The branch is one of the simpler ones in Indo-European, with very few attested languages. It is divided into two groups, Western and Eastern. There are no modern languages left in Western Baltic: Old Prussian died out in the 18th century. Other Western varieties are minimally attested, and even Old Prussian writings are scarce. The principal languages of Eastern Baltic are Latvian and Lithuanian, whose traditions of writing only began in the 16th century as Western Baltic was dying out. Other varieties, such as Latgalian and Samogitian, are sometimes considered separate languages and at other times dialects of Latvian and Lithuanian. The sparse and late attestation of the Baltic languages makes the reconstruction of Proto-Baltic difficult, but the existence of a common stage that is a distinct branch of Indo-European is generally agreed upon (Dini 2014). Old Prussian, Latvian, and Lithuanian form the Baltic side of the data.

5.3 Other languages

Additionally, it should prove fruitful to include a few Indo-European Languages that are not Baltic or Slavic. This will help place Balto-Slavic within a somewhat wider Indo-European phylogeny, though this is by no means an all-encompassing examination of Indo-European relationships. These languages have been chosen because of the contact and connections shared by them with Baltic and Slavic. Most notably among these is Germanic. Petit (forthcoming) notes this connection, with Germanic often sharing an innovation with either Baltic, Slavic, or even both. Among these are the mergers of PIE *o and *a in some way: Proto-Balto-Slavic yielded *a, with Slavic later changing it o, while Germanic merged the short vowels to *a and the long vowels to $*\bar{o}$. Baltic made the same length-based distinction as Germanic, although $*\bar{o}$ could yield o or uo. A number of words are shared between the three branches, with doubts as to whether they were continuations of the original PIE lexicon or innovations shared by all three (Scherer 1941). To get at this Germanic influence, Gothic and Old High German have been included in the dataset.

Another source of influence are the Balkan Indo-European languages. Dini (1997) notes a few similarities shared by Baltic and Balkan languages like Albanian, such as abstract nouns in *-*i-mo*. Moreover, the "Balkan sprachbund" has undoubtedly had an effect on the South Slavic languages, if only because of the prolonged contact over the past 1000 years. To explore these relationships, Albanian and Greek are incorporated into the data. Because of the major isogloss of satemization that Baltic and Slavic share with other Indo-European languages, it is thought that Iranian, another satem language, must have influenced Balto-Slavic in some way, or at the very least had contact. Indeed, Slavic especially had contact with Iranian speakers, from the Scythian and Alanic speakers of the steppes near the proposed Slavic homeland, to more modern Iranian languages. For example, in all of Europe, only Ossetic, an Iranian language of the north Caucasus, and Slavic have second-position clitic strings (Nichols forthcoming). Consequently, to investigate this influence, Ossetic and the oldest Iranian language Avestan have been included as part of the data.

5.4 Data

The actual data for each language are contained in Swadesh lists. As can be seen in other lexicostatistic and computational studies, such as Ringe et al. (2002), these lists of essential vocabulary are the principal form of data used. The idea motivating their use is that nearly every language should have these lexical items, which allows for easier linguistic comparison. For this particular study, each list is comprised of roughly 200 concepts and the respective words in that language, though some languages, such as Old Prussian, fall short of this number due to the scarcity of attestations. Additionally, some languages might have multiple entries for a given concept. The Swadesh lists have been compiled into the one wordlist text file, the input format for LingPy as was described in the previous chapter. The individual lists for the Baltic and Slavic languages are available in Appendix A. A summary of the data is given in Table 6.

Language	Concepts	Total Entries
Slavic		
Belarusian	208	218
Bulgarian	208	217
Czech	208	223
Kashubian	205	206
Lower Sorbian	208	220
Macedonian	208	216
Old Church Slavic	208	236
Polish	208	223
Russian	208	213
Serbo-Croatian	208	224
Slovak	208	229
Slovenian	208	212
Ukrainian	208	223
Upper Sorbian	208	218
Baltic		
Latvian	207	247
Lithuanian	197	261
Old Prussian	173	184
Other Indo-European		
Albanian	204	204
Avestan	172	212
Gothic	194	240
Greek	209	272
Old High German	207	267
Ossetic	200	201

Table 6: Distribution of the data

From the compiled wordlist, the computations for alignment and cognacy are calculated. The individual word lists were taken from the Indo-European Lexical Cognacy Database (IELex: http://ielex.mpi.nl/). These entries were verified through various etymological dictionaries, such as the *Etymological Dictionary of the Baltic Inherited Lexicon* (Derksen 2015), as well as some primary sources like the "Elbing Vocabulary" of Old Prussian. Otherwise, the forms were not altered in any way.

CHAPTER 6

PRELIMINARY RESULTS

Equipped with the LingPy toolkit, we can now explore the Balto-Slavic data that is discussed in the previous chapter. All of the functions used in this analysis are unmodified and represent the abilities of LingPy as it is currently available. This allows us to highlight the areas of strength and weakness in the workflow, so that they can be improved in the following sections. Each subsection is concerned with one aspect of the toolkit and follows the general workflow as outlined above.

6.1 Alignments

While the first overall step is to tokenize the words in our data, we are primarily concerned with the alignment of these segments. Nevertheless, tokenization is important, as it determines the graphemes that are aligned. It is important to reiterate how crucial the results of alignment are for the overall analysis, as it directly influences cognate judgments. The automatically generated alignments show the correspondence sets of segments that ultimately determine cognacy. LingPy does offer several different methods for both pairwise and multiple alignment, but, for this analysis, the SCA method, discussed above, is being used. Keep in mind that this method depends on the use of sound classes: each of the tokenized graphemes is converted into its respective sound class; the sound classes are then aligned; and finally the aligned symbols are converted back into graphemes. A particularly good example of the multiple alignment through SCA of the different words for 'two' in our data set can be seen in Table 7.

This was chosen because it is a fairly salient word that has not undergone too many changes in

the languages. This should make for an easy comparison.

Language	Alignments						
Belarusian	d	-	V	a	-		
Bulgarian	d	-	v	a	-		
Czech	d	-	\mathbf{V}	a	-		
Kashubian	d	-	W	a	-		
Latvian	d	i	v	i	-		
Lithuanian	d	-	v	i	-		
Lower Sorbian	d	-	W	a	-		
Macedonian	d	-	\mathbf{V}	a	-		
Old Church Slavic	d	ŏ	\mathbf{V}	a	-		
Old Prussian	d	-	W	ai	-		
Polish	d	-	v	a	-		
Russian	d	-	v	a	-		
Serbo-Croatian	d	-	v	â:	-		
Slovak	d	-	v	a	-		
Slovenian	d	-	V	â:	-		
Ukrainian	d	-	υ	a	-		
Upper Sorbian	d	-	W	a	j		
Albanian	d	У	-	-	-		
Avestan	d	u	W	a	-		
Gothic	t	-	W	ai	-		
Greek	d	ý	-	0	-		
Old High German	Z	W	e:	n	e		
Ossetian	d	u	W	e	-		

Table 7: SCA alignment for 'two'

In general, the alignment is successful, though it suffers in some areas, such as with Old High German. While the SCA method places a null marker in between the dental ([d/t]) and labial sounds ([v/w]) in almost all of the sequences, it fails to do so for OHG, because of the additional segments *-ne*. It is easy for us to see that that *zwene* should be a cognate, with the *-ne* most likely being another word originally, but the algorithms only see a word that is longer than the others and interprets it as being different. The longest word determines the number of spaces in the alignment matrix. As is shown below, this does have consequences for cognate judgments.

6.2 Cognate judgments

There are already several cognate identification toolkits integrated into LingPy. For this analysis, I have chosen to use the most computationally complex method, LexStat. While it does need a predetermined threshold value, it generates the scoring functions on the fly during its computations, through the identification of regular sound correspondences. Each cognate set is assigned a CogID, which is then written onto the file next to the words that are in that set. We can take the alignments for 'two' that were given above and see how LexStat determined their cognacy, as shown in Table 8.

Language		Alig	CogID			
Belarusian	d	-	v	a	-	3768
Bulgarian	d	-	v	a	-	3768
Czech	d	-	v	а	-	3768
Kashubian	d	-	W	а	-	3768
Latvian	d	i	v	i	-	3768
Lithuanian	d	-	v	i	-	3768
Lower Sorbian	d	-	W	а	-	3768
Macedonian	d	-	v	а	-	3768
Old Church Slavic	d	Ŭ	v	а	-	3768
Old Prussian	d	-	W	ai	-	3768
Polish	d	-	v	а	-	3768
Russian	d	-	v	а	-	3768
Serbo-Croatian	d	-	v	â:	-	3768
Slovak	d	-	v	а	-	3768
Slovenian	d	-	v	â:	-	3768
Ukrainian	d	-	υ	a	-	3768
Upper Sorbian	d	-	W	a	j	3768
Albanian	d	у	-	-	-	3760
Avestan	d	u	W	а	-	3760
Gothic	t	-	W	ai	-	3768
Greek	d	ý	-	0	-	3760
Old High German	Z	W	e:	n	e	3773
Ossetian	d	u	W	e	-	3760

Table 8: CogIDs from LexStat

The successful grouping of the Balto-Slavic words is clear from the start. It should be noted that not all of the forms are in the same grammatical gender. Latvian divi and Lithuanian dvi are both feminine. Masculine forms could be cited, but the fact remains that an expert would be able to identify either form as part of the same cognate set. That, too, is the goal with the automatic judgments. That OHG is in a set unto itself is unsurprising, given the aberrancy displayed by its alignment. As with the gender distinction, another form of the OHG word could be cited here, but this is being used to illustrate the shortcoming of LingPy in respect to partial cognate detection: zwe:- is most certainly cognate with all of the other words here, but it remains undetected because of the additional -ne. It is unexpected that Albanian, Avestan, Greek, and Ossetian would be grouped separately from the others. All of these words go back to Proto-Indo-European $*dw\bar{o}$ - and should be grouped in a single cognate set. That they are not could be a consequence of sound classes: the first vowel of the forms in these languages is high and rounded, representing a distinct sound class. LexStat correctly predicts that Latvian and OCS, which both have a vowel in that same position, are grouped with the rest of Balto-Slavic. The other languages are left out because their first vowels belong to a different sound class. Perhaps this mistake could be avoided with a different system for comparing sequences, such as phonetic features. Moreover, this emphasizes the current necessity for post-processing edits by the linguist in this workflow. For this example, no edits have been made so that LingPy and the other computational approaches can be judged on their own merits and shortcomings, but the editing of these CogIDs would be as simple as changing them to the same number in a text file. While LingPy fell short in this cognate judgment, it still displays its value in being able to quickly analyze a large set of data. The expert linguist will have to make some adjustments *post hoc*, but the amount of time and effort needed to do this is dramatically decreased.

These individual cognate sets are necessary and form the backbone of the linguistic analysis, but their value goes beyond this. The really interesting results come from examining all of the cognate sets for all of the languages in comparison to each other. It is primarily in this way that linguistic relationships are determined: languages that share more cognate sets are generally more closely related. Phylogenetic trees are built from these results. Additionally, we can visualize these relationships through a heatmap showing the percentage of cognates shared by languages in Figure 10.



Figure 10: Percentages of shared cognates

Three groups are clearly visible: a Germanic group (Gothic and OHG), a Baltic group, and a Slavic group. Albanian, Avestan, Greek, and Ossetian share a minimal number of cognates with the other languages. This could be an error on the part of LingPy. We know for a fact that these are all Indo-European languages. In the traditional phylogeny, these languages are more distant from the northern dialects of Germanic and Balto-Slavic. However, these percentages could be a reflection of false negatives in the cognacy judgments: this was seen above for the word 'two,' where these four languages were grouped separately from the rest. This highlights again the need for post-processing edits, as these percentages might be different after corrections.

Also apparent is how many more cognates Baltic and Slavic share with each other (see: the lighter blue bands around the Slavic square). This certainly points to their close relationship, if not outright lending credence to the idea of a common stage. OCS, the language closest in form to Proto-Slavic, has the highest percentage of shared cognates with Lithuanian and Old Prussian, between 0.3 and 0.4. Again, this is indicative of the close relationship between Baltic and Slavic. This can be seen further in the distance scores that LexStat derives between all the languages: a distance score is calculated for each language in each cognate set. The total distance scores are averages of all the scores from all the sets for each language. The lower the distance score, the more closely related the languages are. This can be seen in Table 9 below for only the Baltic and Slavic languages.

Language	Belar.	Bulg	Cz	Kash	Lat	Lith	Lower S	Mac	OCS	OP	Pol	Rus	Serb.	Slovak	Slove	Ukr	Upper S
Belar.	0	0.43	0.29	0.38	0.84	0.85	0.37	0.42	0.28	0.86	0.26	0.24	0.37	0.3	0.37	0.16	0.35
Bulg	0.43	0	0.39	0.51	0.86	0.85	0.5	0.2	0.27	0.88	0.43	0.38	0.25	0.41	0.35	0.43	0.48
Cz	0.29	0.39	0	0.37	0.86	0.84	0.27	0.4	0.25	0.84	0.26	0.29	0.34	0.13	0.32	0.32	0.24
Kash	0.38	0.51	0.37	0	0.88	0.85	0.44	0.52	0.42	0.88	0.27	0.47	0.47	0.35	0.46	0.4	0.42
Lat	0.84	0.86	0.86	0.88	0	0.46	0.87	0.86	0.83	0.68	0.85	0.84	0.85	0.85	0.83	0.84	0.86
Lith	0.85	0.85	0.84	0.85	0.46	0	0.85	0.85	0.81	0.58	0.85	0.83	0.84	0.84	0.83	0.84	0.85
Lower S	0.37	0.5	0.27	0.44	0.87	0.85	0	0.5	0.34	0.86	0.33	0.38	0.45	0.29	0.4	0.34	0.15
Mac	0.42	0.2	0.4	0.52	0.86	0.85	0.5	0	0.28	0.88	0.45	0.39	0.2	0.4	0.34	0.42	0.47
OCS	0.28	0.27	0.25	0.42	0.83	0.81	0.34	0.28	0	0.82	0.3	0.25	0.2	0.27	0.19	0.28	0.3
ОР	0.86	0.88	0.84	0.88	0.68	0.58	0.86	0.88	0.82	0	0.86	0.86	0.86	0.85	0.84	0.86	0.84
Pol	0.26	0.43	0.26	0.27	0.85	0.85	0.33	0.45	0.3	0.86	0	0.33	0.39	0.25	0.35	0.3	0.31
Rus	0.24	0.38	0.29	0.47	0.84	0.83	0.38	0.39	0.25	0.86	0.33	0	0.35	0.33	0.34	0.24	0.38
Serb.	0.37	0.25	0.34	0.47	0.85	0.84	0.45	0.2	0.2	0.86	0.39	0.35	0	0.36	0.22	0.37	0.43
Slovak	0.3	0.41	0.13	0.35	0.85	0.84	0.29	0.4	0.27	0.85	0.25	0.33	0.36	0	0.31	0.33	0.26
Slove.	0.37	0.35	0.32	0.46	0.83	0.83	0.4	0.34	0.19	0.84	0.35	0.34	0.22	0.31	0	0.37	0.36
Ukr	0.16	0.43	0.32	0.4	0.84	0.84	0.34	0.42	0.28	0.86	0.3	0.24	0.37	0.33	0.37	0	0.35
Upper S	0.35	0.48	0.24	0.42	0.86	0.85	0.15	0.47	0.3	0.84	0.31	0.38	0.43	0.26	0.36	0.35	0

Table 9: Distance scores for Balto-Slavic languages

In this, we see the same relationships that were displayed in the heatmap. OCS, out of all the Slavic languages, has the lowest distance scores with the Baltic languages (0.83,0.81, and 0.82, respectively), small though the difference may be. Moreover, we can see that it shares relatively low scores with all of the Slavic languages: this reflects the fact that OCS does not truly belong to any one branch of Slavic. It had many different flavors across the Slavic world, though with slightly stronger ties to Bulgarian and Serbo-Croatian in our attestations. The relationship between Baltic and Slavic is reinforced again: the distance scores are generally around 0.84. These scores are much higher between Balto-Slavic and the more distant Indo-European languages, with most scores around 0.94 and some being as high as 0.99 and 1.00! I believe that this points to the prior relationship between Baltic and Slavic in the form of a Proto-Balto-Slavic

language continuum. The distance scores are higher now simply because of the developments that have happened in both groups since their split.

6.3 Reconstructed phylogeny

As was already stated, we can reconstruct the phylogeny of the given languages based on the cognate judgments. Using the same metrics above, such as the percentage of shared cognates and the distance scores, LexStat is able to generate a bifurcating phylogenetic tree. For this example, I used the UPGMA version of the algorithm. The output is a simple Newick tree format:

(Albanian,((Avestan,Ossetian),(((Kashubian,(((Bulgarian,Macedonian),('Serbo_Croatian',('Old_Church_Slavic',Slovenian))),((Russian,(Belarusian,Ukrainian)),((Polish,(Czech,Slovak)),('Lower_Sorbian','Upper_Sorbian'))))),('Old_Prussian',(Latvian,Lithuanian))),(Greek,(Gothic,'Old_High_German')))));

We can then input this string into a tree-drawing program with the results in Figure 11.



Figure 11: Reconstructed tree using LexStat

This is just another visualization of the data, confirming what we have seen: Baltic and Slavic are closely related. One aberrancy is noticeable here, namely the positioning of Kashubian. It is generally grouped with the West Slavic languages, such as Czech, Polish, and Sorbian. Here it is one of the first offshoots in Slavic. In order to investigate this further, the cognate judgments for Kashubian need to be examined by hand.

6.4 Reconstructions

LingPy does not have a robust module for handling linguistic reconstruction. Instead, it uses the quick-and-dirty consensus reconstructions, where the most frequent character in a given position in the alignments of a cognate set are chosen as the proto-form. This obviously does not result in a good reconstruction, but it is a somewhat-useful tool for these kinds of preliminary investigations. One reconstruction is returned for each cognate set and output into a text file. We can extract the reconstructions. A few examples, focusing specifically on Baltic and Slavic languages, are provided in Table 10.

Word	Consensus	Expert
'two'	*dva	PBS1 *duwo:
'day'	*dein	PBS1*dein-/*din-
'bird'	*ptitsa	PSl *pъtitsa
'blood'	*krov-/krauw-	PBSI *krauja
'thin'	*tunək	PSl *tьпъkъ

Table 10: Example of consensus reconstructions

This is just a representative sample. From it, we can see that very few reconstructions actually match the expert ones. That *dein- is both the expert and consensus reconstruction is merely a happy accident. Nevertheless, while many of the reconstructions are quite different from the desired result, many are salvageable, able to be fixed with just a few edits. This is another opportunity where expert knowledge can work in conjunction with the automatic approaches to

provide the best results for the large amounts of data: a linguist can easily correct these reconstructions after the initial analysis by LingPy. In relation to the Balto-Slavic debate, while it is incredibly hard to reconstruct an entire proto-language for Balto-Slavic, with all the aspects of grammar that we would expect, it is still a good sign that we can reconstruct so much of the lexicon for this stage.

6.5 Borrowing detection

One of the last analyses we can do with LingPy is the hidden borrowing detection. This is done through a direct implementation of the Minimal Lateral Network. Set against the reference tree phylogeny that was reconstructed above, as well as the list of cognate sets in each language, we can predict the borrowing that occurred at different stages in the languages' development. This is represented in the language networks that have already been described, capturing both the vertical inheritance and the horizontal interactions between languages. From the different calculations above, we can derive the language network seen in Figure 12 for all of our data:


Figure 12: Reconstructed network using LexStat

The thickness of the red lines indicates the number of cognates borrowed, and the arrows indicate the direction of borrowing. The MLN is not limited to the terminal nodes, i.e. the attested languages. It also infers borrowing in the ancestral stages of the languages in the network. This can be seen in all of the edges connecting the vertices to both terminal nodes and other vertices. LingPy even outputs lists of the different terms that were borrowed by languages and the stages at which they were borrowed. For example, Table 11 shows all of the inferred borrowings that Old Church Slavic loaned out:

Stage	Word	Gloss
Macedonian	net∫istŭ	dirty
Avestan	inŏ	other
Kashubian	inŏ	other
Albanian	kəli	when
edge.14	sĭ	this
Gothic	sĭ	this
edge.6	t∫rævo	belly
Ossetian	jĭ	he
Ossetian	ji	they
Lower_Sorbian	ənŭ	that
Lower_Sorbian	kəli	when
edge.5	tŗ ^j ti	rub
edge.5	kəli	when
Bulgarian	xapati	bite
Bulgarian	ənŭ	that
Russian	sĭdɛ	here
Russian	tŭ	that
edge.10	zværĭ	animal
edge.10	tukŏ	fat
Old_Prussian	tŏ	he
Old_Prussian	zværĭ	animal
edge.15	dļgŏ	long
edge.15	duimŭ	smoke
edge.15	tukŏ	fat
edge.11	tļstŏ	thick
edge.11	dõti	blow
edge.11	t∫isti	count

Table 21: Inferred borrowings from Old Church Slavic

The language that receives the "loanwords" is given on the left column, and the actual loans and their meanings are given in the subsequent columns. Once again, this all is dependent on the prior cognate judgments. If there are errors in those, there will be errors in this borrowing analysis. As with all aspects of these automatic approaches, the results need interpretation and corrections by linguists. Not all of the inferred borrowings would have happened in the course of the language's development. Ossetian probably did borrow some lexical items from Slavic, especially in the recent past, but it most likely did not borrow directly from OCS. This could instead be seen as indicative of a relationship between the two language groups, rather than between the individual languages. Borrowing at ancestral stages can be seen in the loaning of OCS words *tlstŏ*, *d5ti*, and *tfisti* at edge.11; when we look at the reference tree, we see that all of the Baltic languages branch off from this point. This means that edge.11 represents the Proto-Baltic stage and would have been the point at which these items were borrowed. Moreover, even within Slavic, the "borrowings" do not really appear to be that. Take the words for 'that' above: tǔ and onǔ were both demonstratives in OCS, i.e. 'that' and 'that one.' They are both reconstructed for Proto-Slavic, but certain branches adopted the onŏ-form as their main demonstrative, such as Bulgarian, while other might have adopted the to-form. These are not true borrowings, just different paths of development. These shortcomings could potentially be improved with both more languages and more words in each language. Again, this is where linguists must analyze the outputs directly and correct any of these errors. It is still a useful tool that can allow us to view the data in a non-traditional way, understanding that these languages interact with each other not only through inheritance alone.

These preliminary investigations have shown the usefulness and capabilities of LingPy and its underlying methods. It can easily and quickly analyze large sets of data and do so in novel ways: the Comparative Method does not generally place an emphasis on the horizontal borrowing relationships of languages. That is usually an investigation that takes place after the fact. But here such a thing is built into the general workflow! These are valuable tools that decrease the workload of linguists. They are not a replacement for manual linguistic analysis but can easily work in conjunction with it. Nevertheless, just as apparent are the faults of the systems. Central to them all are the number of inaccurate cognate judgments. All of the other computations depend on these judgments. This is a huge aspect of the workflow that needs to be improved, and one possibility is discussed in the following chapter.

CHAPTER 7

MODIFYING LINGPY

So far, raw LingPy has been applied to the data, and the results are promising, though with room for improvement. As it stands, it is in no way a replacement for an actual linguist, and that should never be the goal of computational methods. Many of the shortcomings of the system stem from failures in cognate judgments. This issue was displayed for the concept 'two,' all the forms for which we know belong to the same cognate set. The two main sets that LingPy derived through the LexStat method were divided as they were because of the presence of a high rounded vowel in one group. This consists of its own sound class, following the LexStat method, and contrasted with other forms that had a different kind of vowel or no vowel at all. Because of this dependency on sound classes, rather than on analyzing each segment individually in their actual attested forms, nuance is lost. Forms must be converted to these different sound classes, that are absolute in their divisions, losing the more specific information that each form holds in its unique, individual segments. These sound classes are computationally expedient, and are good at capturing things like sonority profiles and correspondences between certain types of sounds, but they lack the necessary details to fully carry out the Comparative Method in computational form. They are why LingPy can only do consensus reconstructions: it cannot capture the transitions between specific sounds, as in actual sound changes, but only those between classes. Moreover, the strict adherence to these classes leads to the misjudgment of cognates. The accuracy of cognate judgments is the central pillar of the system: without it, the results of all the other

calculations and functions that are built into LingPy will be skewed in a potentially wrong direction. This is a major aspect that needs to be fixed. It is unlikely that such automatic approaches will ever be foolproof, but there is still plenty of room for improvement before we reach the limits of these methods.

Some of the mistakes by the cognate identification algorithms used in LingPy stem from the use of sound classes. For a more nuanced and detailed analysis of cognacy and all the methods that are dependent on cognacy, we might want to examine phonetic and phonological features. Features are the standard for phonological description of sounds in linguistics. Segments and IPA symbols must still be converted to these feature sets, but, unlike with sound classes, where each class represents multiple distinct sounds, the feature sets have a one-to-one correspondence with their sound: no information is lost in this exchange because each feature set *is* each sound. This should improve nearly all aspects of the system, allowing it to view the data as linguists do and applying the methods and algorithms with more skill. The rest of this chapter details a possible integration of features.

7.1 ALINE

While LingPy is fairly easy to use, it is not so easy that one can just tell it to use a feature-based analysis of the data and it will do it. The whole toolkit is built around the idea of sound classes. This does not affect some submodules, such as the handling of wordlists and the phylogenetic analyses, but it infects all aspects of alignment and cognate identification. Consequently, if we are to integrate features into the system, we must build our methods from the ground up. Luckily, there is a source of inspiration that we can draw from. Mentioned briefly above, Kondrak (2001) details the ALINE algorithm for phonetic alignment. This method uses multivalued phonetic features, inspired by Ladefoged (1995), with some simple binary ones.

These are assigned numerical values that reflect the distances between vocal organs reported in Ladefoged (1995). For example, manner roughly refers to the degree of airstream opening: the more open the manner, the lower its numerical value. The features and their values are given in Table 12.

Feature	Term	Value
Place	[bilabial]	1.0
	[labiodental]	0.95
	[dental]	0.9
	[alveolar]	0.85
	[retroflex]	0.8
	[palate-alveolar]	0.75
	[palatal]	0.7
	[velar]	0.6
	[uvular]	0.5
	[pharyngeal]	0.3
	[glottal]	0.1
Manner	[stop]	1.0
	[affricate]	0.9
	[fricative]	0.8
	[approximant]	0.6
	[high vowel]	0.4
	[mid vowel]	0.2
	[low vowel]	0.0
High	[high]	1.0
	[mid]	0.5
	[low]	0.0
Back	[front]	1.0
	[central]	0.5
	[back]	0.0

Table 32: Basic phonetic features with numerical values

Binary features include such categories as *Syllabic* and *Voice*. These are still encoded with numerical values, with '+ feature' having a value of 1.0 and '- feature' having 0.0. This system was also adapted by Connolly (1997) and Somers (1998). These prior methods did not differentiate the saliency of features: not weighting the features can result in misalignment,

where segments like [p] and [k] are deemed closer than [p] and [p^h]. How values for feature saliency are derived is still up for debate, so the values presented in Table 13 are taken directly from Kondrak (2001)

Feature	Saliency Weight
Syllabic	5
Voice	10
Lateral	10
High	5
Manner	50
Long	1
Place	40
Nasal	10
Aspirated	5
Back	5
Retroflex	10
Round	5

Table 43: Salience-weights for the basic features

These are just used to signal the importance of some features over others. Other systems for feature encoding exist, such as strictly binary features. These are potentially not as useful for phonetic alignment, because sounds that are similar can often differ in a large number of features. Additionally, it is difficult to weight the different features: some propose that they should all be weighted equally, for example. For this present analysis, I have chosen to use the feature system as detailed by Kondrak (2001).

With these numerical values, distances between phonemes, and hence distances between words, can be calculated: the difference between two phonemes' numerical values for each feature are multiplied by the features' salience weight, and then summed up. A similarity score is derived from the distance scores by subtracting the distance from the maximum possible score between two phonemes. Consonant correspondence is emphasized by decreasing the score even further with a vowel penalty if one or both of the segments are vowels. The total similarity score is the sum of the individual scores between pairs of phonemes, with insertion/deletion penalties applied for each unaligned phoneme. This is then normalized by dividing it by the length of the longer word multiplied by the maximum possible score between two phonemes, ensuring that the value falls somewhere in the range [0,1]. This is all built from dynamic programming algorithms (Wagner & Fischer 1974) with extensions for selecting the best alignment (Myers 1995), local and semiglobal alignment (Smith & Waterman 1981), and edit operations (Oommen 1995).

This is the original conception of the ALINE algorithm. It can be used to align two cognates with each other. From the metrics it produces, other calculations can be done, such as exploring sound correspondences and identifying cognates. The limitations of it need only be addressed, namely how it can only be applied to two words at a time. Kondrak (2009) builds upon the original algorithm to handle cognate identification. Through an adaptation of machine translation techniques (namely, Melamed 2000), the ALINE algorithm can be extended to larger datasets, analyzing whole languages and deriving sound correspondences, much like LingPy does already using sound classes. COGIT is the algorithm for cognate identification, subsuming the capabilities of ALINE as well as Kondrak's CORDI algorithm for correspondence identification (Kondrak 2009). COGIT can draw from three sources of evidence for its cognate judgments: phonetic-based scores as outlined in ALINE, the correspondence-based scores from CORDI, and semantic-based scores from semantic feature vectors. The continuous phoneticbased and correspondence-based scores can be converted into a probability of cognacy using Beta distributions. Semantic-based scores are derived using WordNet (Fellbaum 1998) and are consequently dependent on English glosses. One, two, or three of these types of scores can be

used to determine cognacy. Using more than one type generally increases the precision of cognate identification.

Integrating this system into LingPy could prove very useful, hopefully solving some of the issues that limit the current approaches. The potential usefulness of features instead of sound classes has already been discussed. LexStat and other methods are restricted to identifying cognates that are provided with the same gloss. They have no ability to detect cognacy across different meanings. The wider incorporation of a semantic element as a fundamental part of the process could allow for the comparison of words whose meanings might have slightly diverged over the course of time. Additionally, the current binary way of reporting cognacy (either yes or no) is less desirable than probabilities of relationships (List et al. 2017:14). In their full form, COGIT and ALINE can address all of these problems.

7.2 Adapting to LingPy

Kondrak originally created these algorithms using C++, and ALINE is readily available on his website (http://webdocs.cs.ualberta.ca/~kondrak/). In this form, however, it is not compatible with Python-based LingPy. Beyond this, there are a number of aspects that need to be adjusted in order to operate within the overall workflow. COGIT builds upon the two-word limit of ALINE, but only so far: it can only handle bilingual wordlists. LingPy is so useful because it can analyze large wordlists with hundreds of languages at a time. In order to get around this, we must use the same methodology of LexStat and the other methods: each language is paired with every other language, and then alignment occurs for each pairing. Distance scores are derived on a per-word basis and extended to the languages in general, and then cognate judgments are determined based on these. The pairing of languages essentially makes bilingual wordlists, so this will make the implementation of Kondrak's (2009) methods easier: they simply need to be iterated for each language pair.

With these issues in mind, I have created a Python implementation of COGIT and ALINE. A general implementation of ALINE in Python is available in the Natural Language Toolkit (Bird, Klein, & Loper 2009), but only in its two-word input form. I have adapted this into the iterative version I have just described so that it can handle the wordlist inputs of LingPy. In this current form, the semantic analysis has not been integrated. This is done consciously, as LingPy does not currently have a semantics module and the current formatting of the wordlists does not support semantic methods. A version independent of LingPy could easily include the semantic aspect of the analysis, but that is not the present task. The execution of the feature system is flexible: the same features and their numerical values have been lifted wholesale, but feature matrices are matched to IPA symbols, akin to how LingPy sound class models match IPA to sound class symbols. Originally, Kondrak (2000) encoded IPA symbols in ASCII format, but here I have chosen to implement user-defined correspondences between symbols and feature matrices. These can be expanded ad infinitum as the user sees fit: if a needed IPA symbol is not included, it is as simple as copying and pasting the symbol and corresponding features. A number of features have been added, as well, to account for various types of segments such as palatalized consonants. Unfortunately, there are no standardized ways of dealing with these more complex segments in feature notation, and, consequently, the use of binary features to capture palatalization and other similar concepts is a patchwork solution at the moment. Additionally, the cognacy probabilities that the system was originally designed to output have been converted to simple binary judgments. This is in order to retain compatibility with the other modules of LingPy, especially the ones that handle language phylogeny. One limitation of the present

version is that each language is limited to one word per concept. As a consequence, some of the data must be trimmed down in order to function properly with ALINE. This is still an improvement over the original bilingual wordlists. Finally, while Kondrak (2009) advocates a similarity score, I follow Downey et al. (2008) in calculating a normalized distance score,

$$d_{\text{ALINE}} = 1 - \frac{2s}{s_1 + s_2}$$

where *s* is the similarity score between two words, s_1 the score between the first word and itself, and s_2 the score between the second word and itself.

This is a partial implementation of the system described in Kondrak (2009), but it is still a useful alternative to the sound class-based methods of LingPy. An independent version would allow for the use of all features, but many have been omitted to adhere to the requirements of LingPy. The source code is available in Appendix 2, and installation is as simple as copying a new folder to the LingPy directory. In the following chapter, we see how the results of this Python version of ALINE and COGIT compare to the preliminary results of the previous chapter.

CHAPTER 8

FINAL RESULTS

The sourcecode for this implementation draws heavily from the Natural Language Toolkit's variation of Kondrak (2000). It has been expanded to handle multiple languages, but it must be emphasized that this is not a full employment of Kondrak (2009): the semantic capabilities in LingPy are too limited to incorporate that aspect of ALINE and COGIT. With this partial integration, we can begin our final analysis. The goals here are twofold: first, to determine the usefulness of the present ALINE implementation as compared to stock LingPy, and to comment on the Balto-Slavic relationship.

8.1 ALINE in action

Because ALINE was originally conceived as an algorithm for phonetic alignment of cognates, it makes sense to begin with the results of alignment. We can examine the words for 'two' again and compare them with the results of LingPy and the SCA method. As can be seen in the table below, not much has changed. In general, LingPy does well with alignments as is, but the inclusion of ALINE does bring in some small adjustments. In this implementation, as a consequence of ALINE and COGIT applying only to two languages at a time, multiple sequence alignment has to be captured in a roundabout manner: namely, as a series of pairwise alignments between each language pair. From these individual comparisons, we can derive the overall alignments of each word in comparison to all of the other words by seeing how they are aligned

in each pair. This is definitely one area that can be improved in later implementation with the ability to carry out true multiple sequence alignments as can be seen in Table 14.

Language		A	lign	men	ts	
Belarusian	d	-	v	a	-	-
Bulgarian	d	-	v	a	-	-
Czech	d	-	\mathbf{v}	а	-	-
Kashubian	d	-	w	а	-	-
Latvian	d	i	v	i	-	-
Lithuanian	d	-	v	i	-	-
Lower Sorbian	d	-	w	а	-	-
Macedonian	d	-	\mathbf{v}	а	-	-
Old Church Slavic	d	Ŭ	v	a	-	-
Old Prussian	d	-	W	ai	-	-
Polish	d	-	v	a	-	-
Russian	d	-	\mathbf{v}	а	-	-
Serbo-Croatian	d	-	\mathbf{v}	â:	-	-
Slovak	d	-	\mathbf{v}	а	-	-
Slovenian	d	-	v	â:	-	-
Ukrainian	d	-	υ	a	-	-
Upper Sorbian	d	-	W	aj		-
Albanian	d	у	-	-	-	-
Avestan	d	u	W	a	-	-
Gothic	t	-	W	ai	-	-
Greek	d	ý	-	0	-	-
Old High German	Z	-	W	e:	n	e
Ossetian	d	u	W	B	-	-

Table 54: ALINE alignments for 'two'

Two improvements from ALINE and COGIT of standard LingPy can be seen here: the *a* and *j* in Upper Sorbian *dwaj* are now grouped as a single diphthong like Old Prussian and Gothic *ai*, and the *w* in OHG *zwene* is not properly aligned with the other labial segments. This highlights the fact that ALINE is now limited by the length of the longest word: it will use as many gaps as necessary to capture the optimal alignment. Notice also that the *-ne* in OHG is separated out from the rest of the word because it recognizes that it does not align with any segments in the

other words. This will undoubtedly make partial cognate detection easier in future iterations, as those parts of multimorphemic words that are not cognate would remain unaligned.

As with the preliminary analysis, the most interesting results relate to with the cognate judgments. ALINE and COGIT have been integrated so that their output is in the same format as the other methods in LingPy. The ALINE distances are computed for the words and are clustered using the same flat UPGMA method as SCA and LexStat. Again, we can revisit the words for 'two' in order to gain insight into the results of the new method in Table 15.

Language		Alignments					CogID
Belarusian	d	-	v	а	1	١	2067
Bulgarian	d	-	v	a	-	-	2067
Czech	d	-	v	a	-	-	2067
Kashubian	d	-	W	a	-	-	2067
Latvian	d	Ι	v	i	-	-	2067
Lithuanian	d	-	v	i	-	-	2067
Lower Sorbian	d	-	W	a	-	-	2067
Macedonian	d	-	v	a	-	-	2067
Old Church Slavic	d	Ŭ	v	a	-	-	2067
Old Prussian	d	-	W	ai	-	-	2067
Polish	d	-	v	a	-	-	2067
Russian	d	-	v	a	-	-	2067
Serbo-Croatian	d	-	v	â:	-	-	2067
Slovak	d	-	v	a	-	-	2067
Slovenian	d	-	v	â:	-	-	2067
Ukrainian	d	-	υ	a	-	-	2067
Upper Sorbian	d	-	W	aj		-	2067
Albanian	d	Y	-	-	-	-	2067
Avestan	d	U	W	a	-	-	2067
Gothic	t	-	W	ai	-	-	2067
Greek	d	Ý	-	0	-	-	2067
Old High German	Z	-	W	e:	n	e	2068
Ossetian	d	U	W	B	-	-	2067

Table 65: CogIDs from ALINE

The improvements here are not insignificant. Originally, LexStat analyzed these into three groups: one for the Balto-Slavic languages and Gothic, one for Old High German, and one for

the remaining languages. With ALINE, this has been reduced to two groups. OHG remains the outlier, as partial cognate detection has not been implemented into this analysis: the *-ne* adds too much phonetic weight to the word to be grouped with its proper cognates. On the positive side, the high rounded vowels, a separate sound class under LexStat and SCA, are grouped with the other vowels. This is possible because of the phonetic distances derived from the use of weighted features. In this instance, the need for a linguist to edit OHG *zwene* as part of the cognate set still exists, but the original results are improved, as Albanian, Avestan, Greek, and Ossetian are automatically included in that set.

There are lots of small adjustments like this one throughout the dataset. Unfortunately, not all the results are so promising. As before, we can take all of the cognate judgments for all of the languages and see how the languages are related. The accuracy of these results depends up the accuracy of the judgments. In this respect, our implementation of ALINE falls short. We can visualize this again using a heatmap in Figure 13.





This version is notably cooler than our previous visualization using the LexStat results. The same basic trends remain. The Slavic languages are noticeably grouped together, as are the Baltic languages. The lighter band between Slavic and Baltic is still there, indicating a closer and stronger relationship between them than between the other languages, as should be expected. On the whole, however, the total percentages of shared cognates are down dramatically. What was once a large block of red and yellow, indicating high percentages, is now a lukewarm teal. This means that either LexStat identified too many cognates or our version of ALINE is seriously underperforming and not grouping cognates together properly. It is the former that is true, as becomes clear below.

Before we delve into the shortcomings of our implementation, we can first see how the rest of it interacts with LingPy, as well as its other results, such as phylogenetic reconstruction. Because the output for ALINE here is formatted in exactly the same way as the other methods, all of the other modules of LingPy are at our disposal. We can still do calculate the distances between languages, visualize the trees derived from those distances, and even carry out consensus reconstructions. By default, LingPy derives the distances between languages through the average of the distance scores for each language in each cognate set. This is very similar to what Kondrak (2009) describes when calculating the similarities between languages and Downey (2009) proposes for a normalized ALINE distance. The new scores derived using ALINE can be seen in Table 16 for the Baltic and Slavic languages.

Language	Bel	Bul	Cz	Kash	Lat	Lith	LS	Mac	OCS	OP	Pol	Rus	Serb	Slovak	Slove	Ukr	US
Bel	0.00	0.70	0.70	0.74	0.91	0.93	0.69	0.72	0.75	0.92	0.63	0.49	0.74	0.73	0.85	0.52	0.76
Bul	0.70	0.00	0.64	0.75	0.86	0.87	0.72	0.37	0.53	0.90	0.67	0.68	0.60	0.65	0.78	0.67	0.71
Cz	0.70	0.64	0.00	0.66	0.89	0.89	0.68	0.63	0.56	0.89	0.53	0.70	0.66	0.33	0.71	0.70	0.63
Kash	0.74	0.75	0.66	0.00	0.92	0.91	0.64	0.72	0.65	0.89	0.50	0.75	0.76	0.61	0.85	0.68	0.63
Lat	0.91	0.86	0.89	0.92	0.00	0.60	0.92	0.86	0.87	0.83	0.89	0.91	0.89	0.90	0.91	0.89	0.91
Lit	0.93	0.87	0.89	0.91	0.60	0.00	0.94	0.88	0.87	0.74	0.92	0.92	0.88	0.93	0.90	0.94	0.92
Lower S	0.69	0.72	0.68	0.64	0.92	0.94	0.00	0.67	0.65	0.91	0.62	0.70	0.76	0.62	0.84	0.63	0.42
Mac	0.72	0.37	0.63	0.72	0.86	0.88	0.67	0.00	0.49	0.91	0.63	0.72	0.58	0.63	0.80	0.65	0.66
ocs	0.75	0.53	0.56	0.65	0.87	0.87	0.65	0.49	0.00	0.90	0.60	0.69	0.57	0.56	0.80	0.63	0.59
ОР	0.92	0.90	0.89	0.89	0.83	0.74	0.91	0.91	0.90	0.00	0.91	0.91	0.92	0.90	0.92	0.92	0.93
Pol	0.63	0.67	0.53	0.50	0.89	0.92	0.62	0.63	0.60	0.91	0.00	0.69	0.69	0.55	0.79	0.63	0.63
Rus	0.49	0.68	0.70	0.75	0.91	0.92	0.70	0.72	0.69	0.91	0.69	0.00	0.71	0.71	0.79	0.58	0.75
Serb.	0.74	0.60	0.66	0.76	0.89	0.88	0.76	0.58	0.57	0.92	0.69	0.71	0.00	0.64	0.62	0.69	0.73
Slovak	0.73	0.65	0.33	0.61	0.90	0.93	0.62	0.63	0.56	0.90	0.55	0.71	0.64	0.00	0.70	0.63	0.61
Slove	0.85	0.78	0.71	0.85	0.91	0.90	0.84	0.80	0.80	0.92	0.79	0.79	0.62	0.70	0.00	0.80	0.87
Ukr	0.52	0.67	0.70	0.68	0.89	0.94	0.63	0.65	0.63	0.92	0.63	0.58	0.69	0.63	0.80	0.00	0.69
Upper Si	0.76	0.71	0.63	0.63	0.91	0.92	0.42	0.66	0.59	0.93	0.63	0.75	0.73	0.61	0.87	0.69	0.00
1	1																

Table 76: Distances for Balto-Slavic using ALINE

As with the heatmap, the same basic trends from before still exist. OCS still is relatively close to most of the Slavic languages and generally closer to Latvian, Lithuanian and Old Prussian than the other Slavic languages are. Across the board, the scores are all higher, which should be interpreted as less of a relationship. Again, this is in actuality not the case and is the result of

errors on the part of ALINE. Nevertheless, from these distances, we can still calculate the tree structure of the languages, first in the Newick format:

(Greek,((Avestan,(Gothic,'Old_High_German')),(Albanian,(Ossetian,((Slovenian,((('Serbo_Croat ian',('Old_Church_Slavic',(Bulgarian,Macedonian))),(('Lower_Sorbian','Upper_Sorbian'),((Kash ubian,Polish),(Czech,Slovak)))),(Ukrainian,(Belarusian,Russian)))),('Old_Prussian',(Latvian,Lith uanian))))))));

We can use third-party software to visualize this as a bifurcating tree in Figure 14.



Figure 14: Reconstructed tree using ALINE

The general structure of the tree is not surprising. There are a few outliers. Ossetian being closer to Baltic and Slavic than to the older Iranian language Avestan, is perhaps indicative of the

mutual relationship between Balto-Slavic and Iranian as discussed earlier, but it is still surprising, especially that it would be so far removed from Avestan. Of course, no real exploration of Iranian can be carried out here without more data from other languages. That Slovenian should be the first offshoot from Slavic is also unexpected. There are some positive groupings, namely that the Kashubian oddity from the preliminary exploration is corrected: there is a much tighter grouping of the West Slavic languages. East Slavic, the other South Slavic languages, and Baltic all group together as expected.

The present implementation does not add anything new to the consensus reconstructions LingPy carries out: it still chooses the most common segment in each alignment position. However, we can still look at the Minimal Lateral Network for the ALINE cognate judgments. The reference tree is still relatively accurate, though it is based on percentages of cognates that are inaccurate. With the dramatic differences in cognate judgments there are undoubtedly differences in the MLN. Indeed, there are more borrowings predicted in this instance, as a consequence of so many cognates going undetected: there are more lines between all of the nodes, representing all of the "borrowings" and interactions between the languages, as is evident in Figure 15.



Figure 15: Reconstructed network using ALINE

In our preliminary investigation, we looked at the proposed borrowings from OCS into other

languages; we can do the same again here, as in Table 17.

Stage	Word	Gloss
Latvian	t∫itə	what
edge.5	vezati	tie
Gothic	SI	this
Avestan	t∫itə	what
Avestan	vædæti	know
Upper_Sorbian	t∫yti	smell
Upper_Sorbian	læto	year
Old_Prussian	metati	throw
Old_Prussian	vætru	wind
Czech	vrivi	rope
Czech	gəræti	burn
Kashubian	əkrəglu	round
Kashubian	kotə	who
Russian	əstru	sharp
Russian	kəgda	when
edge.8	dļgʊ	long
edge.8	əstru	sharp
edge.8	vlasi	hair
Ukrainian	tiskati	squeeze
Ukrainian	metati	throw
Ukrainian	gəræti	burn
Lithuanian	əstru	sharp
Lithuanian	əgnı	fire
Lithuanian	vædæti	know
edge.7	3ļ ^j to	yellow
edge.7	mravıjı	ant
edge.7	mŗznəti	freeze
edge.7	pļnʊ	full
Slovenian	munogo	many
Slovenian	vlæ∫ti	pull
Slovenian	rɛ∫ti	say
Slovenian	sopati	sleep
Slovenian	pŗisi	breast
Slovenian	otrot∫ε	child

Table 87: Inferred borrowings from Old Church Slavic using ALINE

Just from a raw numbers perspective, originally, there were 27 proposed borrowings from OCS, and now there are 34. Moreover, none of the words match across both analyses! This illustrates once again how critical accurate cognate judgments are for the entire workflow. None of these results can be trusted when the majority of cognates are undetected.

8.2 Evaluation against other methods

How can we be sure that our ALINE implementation is underperforming and that the other algorithms, like LexStat, are returning too many false positives? As always, we turn to the experts for help: we can evaluate the results from both methods against the cognate judgments of actual linguists. This takes the guesswork out of our comparison, as it provides a gold standard against which we can measure ALINE and other methods. List et al. (2017) provides a number of test datasets which are accompanied by expert cognate judgments, as well as the results of analyses using the network-based Infomap algorithm and the computationally-expedient Turchin method. As our evaluation dataset, we take the Slavic subset of the Indo-European test data. The ALINE cognate judgments are taken from our analysis. LingPy has evaluation methods already built into its systems, the main one being B-Cubed scores, as first described by Bagga (1998). Amigo (2009) showed that they can also be used to compare cluster decisions. Hauer (2011) was the first to apply them to the task of automatic cognate detection. We can calculate the B-Cubed scores for the Infomap and Turchin methods that were done in List et al. (2017), as well as for our ALINE implementation and the results of our LexStat analysis. These can be seen in Table 18.

B-Cubed Scores	ALINE	LexStat	Infomap	Turchin
Precision	0.9844	0.9700	0.9775	0.9877
Recall	0.7927	0.9274	0.9455	0.8462
F-Score	0.8782	0.9482	0.9613	0.9115

Table 98: Comparison of B-Cubed scores for ALINE and three other methods

There are three values returned. Precision represents the number of false positives in the results, i.e. words that are deemed to be cognates but are actually not. A low number of false positives yields a high Precision. Our version of ALINE shines in this regard: there are very few cognate sets that should not be grouped together. This does outperform the results from LexStat discussed the preliminary results. The other two metrics are where ALINE falls well short of acceptability. Recall is governed by the number of detected cognate sets: the lower the Recall score, the higher the number of false negates, i.e. undetected cognates. With a Recall score below 80, ALINE is letting too many cognates go undetected. The F-Score represents the overall accuracy at recovering cognate sets, taking both Precision and Recall into effect. The low Recall score brings the general accuracy of our cognate judgments down.

We know that ALINE is going to underperform, but we still do not know why. LingPy's evaluation methods allow us to output a comparison between cognate judgments. Two instances of false negatives in the words for 'burn' and 'bark' from the test dataset are presented in Table 19.

Language	burn	CogID	AlineID	LexStatID
Czech	hoṛɛt	1	1	1
Russian	gor ^j et ^j	1	3	1
Polish	paλiteee	2	2	2
Language	bark	CogID	AlineID	LexStatID
Language Czech	bark kuːra	CogID 1	AlineID 1	LexStatID 1
Language Czech Polish	bark kuːra kəra	CogID 1 1	AlineID 1 2	LexStatID 1 1

Table 109: Comparison of cognate sets from ALINE and LexStat

These are indicative of common trends throughout the results. Take the words for 'bark:' the only real difference between all three of them is that Czech has a long first vowel. In the Czech and Russian words for 'burn,' the main difference is the palatalization of the *r* and *t* in Russian. After examining all of the results, it becomes readily apparent that our implementation of ALINE is inconsistent with the way it handles long vowels and palatalized consonants. While these are certainly not the only segments it has trouble with, they are among the primary reasons for undetected cognates. This is because long vowels and palatalization add to the distance scores, and, if the scores are above the predetermined threshold, then the words will not correctly cluster together.

Beyond the issue of adjusting the feature weight values, the high number of undetected cognates by the ALINE implementation illustrates the need for good and consistent transcriptions. While the current conception allows for any orthographic system so long as each symbol is matched to a feature matrix, it is dependent on the transcriptions being consistent across the languages that are involved. If there are inconsistencies, there will be problems in the comparison of sequences. For example, many of the Slavic languages have a five-vowel system.

While there are certainly differences in the production of these vowels from language to language, most linguists would probably transcribe them all with the same IPA symbols. In the wordlists taken from IELex, the transcriptions of these vowels differ between the languages. An example of this can be seen in the Polish and Russian words for 'bark' in Table 19: Polish has an [5] while Russian has [6]. Here, ALINE still groups them as cognates, but elsewhere this could cause words to be grouped separately because of an increase in phonetic distance. Another example is in Polish *pa*(*itcee*, where the palatal [Λ] if often transcribed simply as [1^j]. This inconsistency in handling palatalized segments could be one of the main reasons why ALINE has so much trouble with them. Another example is the sporadicly interchangeable use of alveopalatal [f] and retroflex [s]. These differences in transcription equal differences in the feature matrices, which lead to distances scores that prohibit cognate groupings. Sound classes are less affected by this because they do not rely on the details of the transcriptions: all symbols are converted into a smaller set of sound classes. Compare this to the phonetic features, where each symbols has its own unique feature matrix. This goes a long way to explaining the large number of false negatives from ALINE.

Beyond the transcriptions themselves, there are issues in the selection of words in the lists. At times, the words that are most frequent in a language are chosen without regard to their cognacy status: for example, the Polish *paxitece* is probably the more common form of a word meaning 'burn' (although it is a reflexive form with a more basic meaning of 'to light on fire'; this same form can be found in other Slavic languages), there is a word, *gorzeć*, that means 'to burn' and is cognate with the Czech and Russian words in Table 19. When wordlists are compiled, it needs to be clear whether they are based on frequency or cognacy. This is more important for the well-documented languages like Indo-European, where cognacy has already

been explored at great length. Ideally, we should be able to include all the possibly relevant forms in these lists; this would go hand-in-hand with improved semantic capabilities. With more consistent transcriptions and a refined choice of words, I would expect the results of this version of ALINE to improve dramatically. Fixing these wordlists is beyond the scope of the present thesis, but these issues do illustrate the ever-present need for accurate and vetted data in all studies.

8.3 Areas of improvement

It is obvious that this version of ALINE needs a lot of work. There are promising signs: the number of false positives is very low. Moreover, certain cognates are correctly grouped together with ALINE but not with other methods. The integration of phonetic features was chosen precisely to deal with the shortcomings of sound classes, but they have their own problems, too. How they are conceived in my code leads to inconsistencies with the results: sometimes words with long vowels are properly grouped with their cognates and other times they are not. The ways in which certain segments are weighted needs to be adjusted so that these small segments do not lead to inaccurate judgments. It might prove useful to move to languagespecific scoring schemes, as are found in LexStat and Infomap, where the scoring schemes are derived as the analysis is carried out. As it stands, all languages are scored the same way, i.e. features always have the same values, independent of specific correspondences between language pairs. Moreover, the other methods are able to identify more cognates simply because they can analyze more words at once: each language can have multiple entries for each concept. Thus there might be two OCS words for the same thing: one is cognate with Russian and the other is cognate with Bulgarian. Those two words add to OCS' relationships with the other

languages, but the present system cannot capture both at the same time. This is not the main reason for the decreased number of cognates, but it does play a role.

Solving these kinds of issues are imperative, as I still believe ALINE has much to offer, especially when it comes to automatic reconstruction. Even if the issues for cognate detection are not solved, using features to carry out reconstructions could prove useful. Sound classes, as they have proven to yield more accurate results at this point in time, could be used to do most of the analysis concerning cognacy. Afterwards, the segments in the aligned cognate sets can be converted into phonetic feature matrices. From there, we could model the sound changes between cognates through an interpolation of the feature matrices, extrapolating back to a feature matrix that is likely to lead to all attested forms. This would be like finding the midpoint in the distance scores between words and converting that back into feature matrices and then again into actual segments. This would be a dramatic improvement over the limited consensus reconstructions, as it would actually model sound change as it is viewed by linguists. Frequency of segments does play a role, but it is not the absolute rule to reconstruct the most common segments in a correspondence set.

Even without the current shortcomings of undetected cognates, it must still be noted that the present analysis is not even a full implementation of ALINE. The capabilities of LingPy are too limited to carry out a semantic analysis on the level of Kondrak's (2009) original conception. The integration of a semantics module is something to explore in the future, as it could solve the problem of only comparing forms which have exactly the same concept entries in the wordlists.

Despite all of these problems with our ALINE implementation, one thing is still clear: Baltic and Slavic are closely related. Even with all of the undetected cognates, their relationship is still visible in the heatmap and reconstructed phylogeny, albeit to a diminished degree. The evidence reviewed in Chapter 2 is backed up by our results here and in Chapter 6. This is not only the result of geographic proximity. That certainly played a role in the course of their development, as they had nearly exclusive access to one another for centuries. The root of their connection must go back to a common stage. If it were just based on borrowings and the like, then surely we would see similar interactions with the other languages around them. Even with the flaws we have covered, both in our preliminary results and here, this is clearly not the case. While Baltic and Slavic do not share as many cognates between themselves as they do internally, their percentage of shared cognates is much higher with each other than with any of the other Indo-European languages that were included to contextualize their relationship. The computations that have been conducted here go beyond surface-level observations. All of this points to a stage of common development: Proto-Balto-Slavic. Not all of the similarities shared by Baltic and Slavic are uniform across the dialects. Of course, it must be kept in mind that there are no perfectly uniform speech communities. Any variations that are found are likely the result of variations in the Balto-Slavic speech communities, just as there are variations within every observed language. These variations do not undermine the Balto-Slavic theory, but instead make it seem like a natural language instead of some uniformly reconstructed entity. As an avenue for further exploration, it would be interesting to see how Balto-Slavic compares to Indo-Iranian, an accepted Indo-European subgroup, and Italo-Celtic, which is generally not deemed to be a singular subgroup but, instead, two different subgroups that share a number of parallel

developments. As of right now, the distance scores calculated from the cognate judgments are always relative to the languages involved. There is no accepted method for comparison of distances scores across studies. This makes such a comparison hard to do at the moment, and the creation of such a method is beyond the scope of this thesis. However, this warrants further investigations: the distance metrics used can still be difficult to interpret outside of the limited context provided by the involved languages. We cannot really say what a difference of 0.15 in distance scores between languages means other than that they are different. Finding statistical significance in these scores will go a long way in imporving interpretability and help to make the comparison of subgroups a reality. Of course, the relationships between languages vary wildly, and it is unlikely that we will ever find a quantifiable definition for what a subgroup is, e.g. a certain percentage of shared cognates that may be reliably be taken to indicate subgroup status. Nevertheless, it could prove interesting to examine Balto-Slavic in an even wider Indo-European context. For now, however, we can remain confident in the Balto-Slavic hypothesis.

CHAPTER 9

CONCLUSIONS

The data has been thoroughly examined twice now. Though the results of our final analysis were not ideal, they did nothing to undermine the Balto-Slavic hypothesis or the value of computational methods. From the outset, computational approaches to historical linguistics have been viewed as a useful tool, a new way to explore data. It can never take the place of a linguist. It should only ever supplement the work of experts. LingPy and the other methods discussed are useful for exploratory purposes, able to analyze large swathes of data in a fraction of the time it takes to do by hand. While there are shortcomings in the present version of LingPy, its offerings of various methods have proven to be among the best. Alongside this investigation of LingPy, I created a version of the ALINE algorithm in Python that can interact with the different modules and methods that come preloaded with LingPy. The integration of phonetic features lead to more better cognate judgments in some instances, but on the whole, because of the weighting of features like vowel length and palatalization, many cognates went undetected. The Precision of the current implementation is promising, but there is much work to be done to make it as accurate as the LexStat and Infomap, let alone expert judgments.

Continued improvements in these automatic approaches are a necessity: more and more data are becoming available, allowing for the investigation of previously unanalyzed languages and language groups. Testing these methods on well-documented families like Indo-European will allow us to prepare them for use on less-documented languages. The ideal goal is to help

survey these groups: computational approaches can break the ground for thousands of languages in an exploratory analysis that can more easily be vetted and improved by linguists who know and understand the languages.

While this thesis explored the viability of computational methods for historical linguistics, it did so through the lens of the Balto-Slavic hypothesis. While it has been a topic of debate over the course of Indo-European linguistics, all evidence from the quantitative explorations conducted here point to their close relationship. As a result of these investigations and the evidence gathered by linguists in the past, it is a relatively safe conclusion that Baltic and Slavic shared a Proto-Balto-Slavic stage of development. Computational methods simply allowed us to view this data in a new way.

REFERENCES

- Ambrazas, Saulius. 1991. Baltų ir slavų kalbų vardažodžių daryba (senosios bendrybės ir skirtybės) [Word formation of nouns in Baltic and Slavic (old common traits and differences)]. *Baltistica* 27(1): 15-34.
- Amigo, Enrique, Julio Gonzalo, Javier Artiles, and Felisa Verdejo. 2009. A comparison of extrinsic clustering evaluation metrics based on formal constraints. *Information Retrieval* 12(4): 461–486.
- Atkinson, Quentin D. and Russell D. Gray. 2005. Are accurate dates an intractable problem for historical linguistics? In Carl Lipo, Michael O'Brien, Mark Collard, Stephen Shennan (eds.), *Mapping our ancestry: phylogenetic methods in anthropology and prehistory*, Chicago: Aldine, 269–296.
- Bergsma, Shane and Grzegorz Kondrak. 2007. Multilingual cognate identification using integer linear programming. *Proceedings of the 2007 Conference on Recent Advances in Natural Language Processing (RANLP)*, Workshop on Acquisition and Management of Multilingual Lexicons, Workshop held in Borovets (Bulgaria). 11-18.
- Bird, Steven, Ewan Klein, and Edward Loper. 2009. *Natural Language Processing with Python*. Sebastopol, CA: O'Reilly Media. http://www.nltk.org/book/.
- Birnbaum, Henrick. 1970. Four Approaches to Balto-Slavic. In Velta Rūķe-Draviņa (ed.), Donum Balticum. To Professor Christian S. Stang on the occasion of his seventieth birthday 15 March 1970. Stockholm: Almqvist & Wiksell, 69-76.

- Bopp, Franz. 1833-1849. Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, Litthauischen, [Altslawischen], Gothischen und Deutschen. Berlin: Ferdinand Dümmler.
- Bopp, Franz. 1853. Über die Sprache der alten Preu∫sen. Abhandlung der Akademie der Wissenschaften, Berlin: Ferdinand Dümmler, 77-131.
- Bouchard-Côté, Alexandre, David Hall, Thomas L. Griffiths, and Dan Klein. 2013. Automated reconstruction of ancient languages using probabilistic models of sound change. *PNAS* 110(11): 4224–4229.
- Bouckaert, Remco, Philippe Lemey, Michael Dunn, Simon J. Greenhill, Alexander V.
 Alekseyenko, Alexei J. Drummond, Russell D. Gray, Marc A. Suchard, and Quentin D.
 Atkinson. 2012. Mapping the origins and expansion of the Indo-European language
 family. *Science* 337(6097): 957–960.
- Brugmann, Karl. 1886. *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen*¹. Band I. Strassburg: Trübner.
- Brugmann, Karl. 1897. *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen*². Band I. Strassburg: Trübner.
- Brugmann, Karl. 1904. *Kurze vergleichende Grammatik der indogermanischen Sprachen*. Strassburg: Trübner.
- Connolly, John H. 1997. Quantifying target-realization differences. *Clinical Linguistics & Phonetics* 11: 267-298.
- Covington, Michael A. 1996. An algorithm to align words for historical comparison. *Computational Linguistics* 22(4): 481-496.

- Dagan, Tal, Yael Artzy-Randrup, and William Martin. 2008. Modular networks and cumulative impact of lateral transfer in prokaryote genome evolution. *PNAS* 105(29):10039–44.
- Dediu, Dan. 2010. A bayesian phylogenetic approach to estimating the stability of linguistic features and the genetic biasing of tone. *Proceedings of the Royal Society B* 278: 474-79.
- Dempster A., N. Laird, and D. Rubin. 1977. Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society*, 39:1–38.

Derksen, Rick. 2008. Etymological Dictionary of the Slavic Inherited Lexicon. Leiden: Brill.

Derksen, Rick. 2015. Etymological Dictionary of the Baltic Inherited Lexicon. Leiden: Brill.

Dini, Pietro. 1997. Le lingue baltiche. Florence: La Nuova Italia.

- Dolgopolsky, Aharon. 1964. Gipoteza drevnejšego rodstva jazykovych semej Severnoj Evrazii s verojatnostej točky zrenija [A probabilistic hypothesis concerning the oldest relationships among the language families of Northern Eurasia]. *Voprosy Jazykoznanija* 2: 53–63.
- Downey, Sean S., Brian Hallmark, Murray P. Cox, Peter Norquest, and J. Stephen Lansing.
 2008. Computational feature-sensitive reconstruction of language relationships:
 Developing the ALINE distance for comparative historical linguistic reconstruction.
 Journal of Quantitative Linguistics 15(4): 340–369.
- Durbin, Richard, Sean R. Eddy, Anders Krogh, and Graeme Mitchinson. 2002. *Biological* sequence analysis. Probabilistic models of proteins and nucleic acids, 7 edn. Cambridge: Cambridge University Press.

Endzelīns, Jānis. 1911. Slavjano-baltiiskie etjudy [Balto-Slavic studies]. Chark'ov: Zil'berberg.

Fortson, Benjamin W., IV. 2004. Indo-European Language and Culture: An Introduction. Malden, Massachusetts: Blackwell. Fraenkel, Ernst. 1926. Der prädikative Instrumental im Slavischen und Baltischen und seine syntaktischen Grundlagen. *Archiv für slavische Philologie* 40. 77–117.

Fraenkel, Ernst. 1950. Die baltischen Sprachen. Heidelberg: Winter.

- Rexová, Katerina, Yvonne Bastin, and Daniel Frynta. 2006. Cladistic analysis of Bantu languages: a new tree based on combined lexical and grammatical data. *Naturwissenschaften* 93: 189-194.
- Gimbutas, Marija. 1992. The Chronologies of Eastern Europe: Neolithic through Early Bronze Age. Chronologies in Old World Archaeology, vol. 1. Chicago: University of Chicago Press.
- Girvan, Michelle and Mark E. J. Newman. 2002. Community structure in social and biological networks. *PNAS* 99 (12): 7821–7826.
- Gray, Russell D. and Quentin D. Atkinson. 2003. Language-tree divergence times support the Anatolian theory of Indo-European origin. *Nature* 426: 435–439.
- Gray Russell D. and Fiona M. Jordan. 2000. Language trees support the express-train sequence of Austronesian expansion. *Nature* 405(6790): 1052–1055.
- Greenhill, Simon J., Alexei J. Drummond, and Russell D. Gray. 2010. How accurate and robust are the phylogenetic estimates of Austronesian language relationships? *PLoS One*, 5(3): e9573.
- Gusfield, Dan. 1997. *Algorithms on strings, trees and sequences*. Cambridge: Cambridge University Press.
- Henikoff, Steven and Jorja Henikoff. 1992. Amino acid substitution matrices from protein blocks. *PNAS* 89(22): 10915–10919.

Hirt, Herman. 1895. Der indogermanische Akzent: Ein Handbuch. Strassburg: Trübner.
- Holden, Clare J. 2002. Bantu language trees reflect the spread of farming across sub-Saharan Africa: a maximum-parsimony analysis. *Proceedings of the Royal Society B* 269: 793–799.
- Holman, Eric W., Cecil H. Brown, Soren Wichmann, Andre Müller, Viveka Velupillai, Harald Hammarström, Sebastian Sauppe, Hagen Jung, Dik Bakker, Pamela Brown, Oleg Belyaev, Matthias Urban, Robert Mailhammer, Johann-Mattis List, and Dmitry Egorov. 2011. Automated dating of the world's language families based on lexical similarity. *Current Anthropology* 52(6): 841–875.

Indo-European Lexical Cognacy Database. http://ielex.mpi.nl/.

- Ivanov, Vyacheslav and Vladimir Toporov. 1958. *K postanovke voprosa o drevnejšix otnošenijax baltijskix i slavjanskix jazykov* [On the status of the question concerning the oldest relationships of the Baltic and Slavic languages]. Moscow: Izdatel'stvo A. N. SSSR.
- Kaplan, Ronald and Martin Kay. 1994. Regular models of phonological rule systems. Computational Linguistics 20(3): 331-378.
- Kessler, Brett. 2001. The significance of word lists. Statistical tests for investigating historical connections between languages. Stanford: CSLI Publications.
- Knight, Kevin and Jonathan May. 2009. Applications of Weighted Automata in Natural
 Language Processing. In Manfred Droste, Werner Kuich, and Heiko Volger (eds.),
 Handbook of Weighted Automata. Berlin: Springer Science & Business Media.
- Kondrak, Grzegorz. 2000. A new algorithm for the alignment of phonetic sequences. In Proceedings of the 1st North American chapter of the Association for Computational

Linguistics conference, NAACL 2000, Stroudsburg, PA: Association for Computational Linguistics, 288–295.

- Kondrak, Grzegorz. 2001. Identifying Cognates by Phonetic and Semantic Similarity.
 Proceedings of the Second Meeting of the North American Chapter of the Association for
 Computational Linguistics, NAACL 2001, Stroudsburg, PA: Association for
 Computational Linguistics, 103-110.
- Kondrak Grzegorz. 2002. Algorithms for Language Reconstruction. PhD thesis. University of Toronto.
- Kondrak, Grzegorz. 2009. Identification of Cognates and Recurrent Sound Corrsepondences in Word Lists. *Traitment automatique des langues et langues anciennes* 50(2): 201-235.
- Kostrzewski, Józef. 1956. Stosunki między kulturą łużycką i bałtycką [Relations between the Lusatian and Baltic cultures]. *Slavia Antiqua* 5: 1-76.

Ladefoged, Peter. 1995. A Course in Phonetics. New York: Harcourt Brace Jovanovich.

- Lehmann, Winfred P. 1993. *Theoretical Bases of Indo-European Linguistics*. London: Routledge.
- Lemey, Philippe, Andrew Rambaut, Alexei J. Drummond, and Marc A. Suchard. 2009. Bayesian Phylogeography Finds Its Roots. *PLOS Computational Biology* 5: e1000520.
- Leskien, August. 1876. Die Declination im Slavisch-Litauischen und Germanischen. Leipzig: Hirzel.
- Levenshtein, Vladimir. 1965. Dvoičnye kody s ispravleniem vypadenij, vstavok i zames čenij simvolov [Binary codes with correction of deletions, insertions and replacements]. Doklady Akademij Nauk SSSR 163 (4): 845–848.

- List, Johann-Mattis and Robert Forkel. 2016. LingPy. A Python library for historical linguistics. Version 2.5: http://lingpy.org.
- List, Johann-Mattis and Steven Moran. 2013. An open source toolkit for quantitative historical linguistics. In *Proceedings of the ACL 2013 System Demonstrations*. Stroudsburg, PA: Association for Computational Linguistics, 13–18.
- List, Johann-Mattis. 2012a. LexStat: Automatic detection of cognates in multilingual wordlists. In *Proceedings of the EACL 2012 Joint Workshop of LINGVIS & UNCLH*. Stroudsburg, PA: Association for Computational Linguistics, 117–125.
- List, Johann-Mattis. 2012b. SCA. Phonetic alignment based on sound classes. In Marija Slavkovik and Daniel Lassiter (eds.), *New directions in logic, language, and computation*, number 7415 in LNCS, Berlin: Springer, 32–51.
- List, Johann-Mattis. 2014. Sequence comparison in historical linguistics. Dusseldorf: Dusseldorf University Press.
- List, Johann-Mattis, Simon J. Greenhill, and Russell D. Gray. 2017. The potential of automatic word comparison for historical linguistics. *PLOS ONE* 12.1: 1-18.
- List, Johann-Mattis, Philippe Lopez, and Eric Bapteste. 2016. Using sequence similarity networks to identify partial cognates in multilingual wordlists. In *Proceedings of the Association of Computational Linguistics 2016* (Volume 2: Short Papers). Stroudsburg, PA: Association for Computational Linguistics, 599–605.

Lynch, John, ed. 2003. Issues in Austronesian. Canberra: Pacific Linguistics.

- McMahon, April and Robert McMahon. 2005. *Language classification by numbers*. Oxford: Oxford University Press.
- Meillet, Antoine. 1908. Les dialectes indo-européens. Paris: Champion.

- Melamed, I. Dan. 2000. Models of Translational Equivalence among Words. *Computational Linguistics* 26(2): 221-249.
- Morgenstern, Burkhard, Andreas Dress, and Thomas Werner. 1996. Multiple DNA and protein sequence alignment based on segment-to-segment comparison. *PNAS*, USA 93: 12098–12103.
- Myers, Eugene W. 1995. Seeing Conserved Signals: Using Algorithms to detect Similarities Between Biosequences. In Eric S. Lander and Michael S. Waterman (eds.), *Calculating the Secrets of Life*, Washington: National Academy Press, 56-89.
- Nakhleh, Luay, Don Ringe, and Tandy Warnow. 2005. Perfect phylogenetic networks: a new methodology for reconstructing the evolutionary history of natural languages. *Language* 81: 382–420.
- Needleman, Saul B. and Christian D. Wunsch. 1970. A general method applicable to the search for similarities in the amino acid sequence of two proteins. *Journal of Molecular Biology* 48: 443–453.
- Nelson-Sathi Shijulal, Johann-Mattis List, Hans Geisler, Heiner Fangerau, Russell D. Gray,
 William Martin, and Tal Dagan. 2011. Networks uncover hidden lexical borrowing in
 IndoEuropean language evolution. *Proceedings of the Royal Society B* 278(1713): 1794–
 1803.
- Nerbonne, John and Wilbert Heeringa. 1997. Measuring dialect distance phonetically. In John Coleman (ed.), *Proceedings of the Third Meeting of the ACL Special Interest Group in Computational Phonology* (SIGPHON-97), 11-18.

- Nichols, Johanna. Forthcoming. The evolution of Slavic. In Jared S. Klein, Brian D. Joseph, and Matthias Fritz (eds.), *Handbook of Comparative and Historical Indo-European Linguistics*. Berlin: Mouton de Gruyter.
- Oakes, Michael P. 2000. Computer estimation of vocabulary in a protolanguage from word lists in four daughter languages. *Journal of Quantitative Linguistics* 7: 233–244.
- Oommen, B. John. 1995. String Alignment With Substitution, Insertion, Deletion, Squashing, and Expansion Operations. *Information Sciences* 83: 89-107.
- Ostermeyer, Gottfried. 1775. Kritischer Beytrag zur Altpreußi∫chen Religionsge∫chichte, Marienwerder, in der Königl. We∫tpreuß. Hofbuchdruckerey bey Johann Jacob Kanter.
- Ostermeyer, Gottfried. 1780. Gedanken von den alten Bewohnern des Landes Preu∬en, Königsberg und Leipzig. bey Gottlieb Lebrecht Hartung.
- Petit, Daniel. 2004. Les langues baltiques et la question balto-slave. *Histoire Epistémologie Langage* 26(2): 7–41.
- Petit, Daniel. Forthcoming. Balto-Slavic. In Jared S. Klein, Brian D. Joseph, and Matthias Fritz (eds.), *Handbook of Comparative and Historical Indo-European Linguistics*. Berlin: Mouton de Gruyter.
- Pisani, Vittorio. 1932. Balto e slavo. Studi Baltici 2: 1-22.
- Pohl, Heinz-Dieter. 1992. Die baltoslavische Spracheinheit areale Aspekte. In Indogermanisch, Slawisch und Baltisch, Materialien des vom 21.-22. September 1989 in Jena in Zusammenarbeit mit der Indogermanischen Gesellschaft durchgeführten Kolloquiums. Munich: Sagner. 137-164.
- Prokić, Jelena, Martijn Wieling, and John Nerbonne. 2009. Multiple sequence alignments in linguistics. In *Proceedings of the EACL 2009 Workshop on Language Technology and*

Resources for Cultural Heritage, Social Sciences, Humanities, and Education. Stroudsburg, PA: Association for Computational Linguistics, 18–25.

- Rama, Taraka, Prasant Kolachina, and Sudheer Kolachina. 2013. Two methods for automatic identification of cognates. In Thomas Weilfaert, Kris Heylen, and Dirk Speelman (eds.), *Proceedings of the 5th QITL Conference*, Leuven: Leuven University Press, 76–80.
- Ringe, Don, Tandy Warnow, and Ann Taylor. 2002. Indo-European and computational cladistics. *Transactions of the Philological Society* 100: 59–129.
- Ronquist, Fredrik and John P. Huelsenbeck. 2003. MrBayes 3. Bayesian phylogenetic inference under mixed models. *Bioinformatics* 19(12): 1572–1574.
- Rosvall, Martin and Carl T. Bergstrom. 2008. Maps of random walks on complex networks reveal community structure. *PNAS* 105(4): 1118–1123.
- Rozwadowski, Jan. 1912. O pierwotnym stosunku wzajemnym języków bałtyckich i słowiańskich [On the original mutual relationship of the Baltic and Slavic languages]. *Rocznik Slawistyczny* 5: 1–36.
- Saitou, Naruya and Masatoshi Nei. 1987. The neighbor-joining method: A new method for reconstructing phylogenetic trees. *Molecular Biology and Evolution* 4: 406–425.
- Schleicher, August. 1853. O jazyku litevském, zvláště ohledem na slovanský [On the Lithuanian language, especially with regard to Slavic]. *Českého Museum* 27: 320-334.
- Schleicher, August. 1861. Compendium der vergleichenden Grammatik der indogermanischen Sprachen. Weimar: Böhlau.
- Schmid, Wolfgang. 1992. Die Stellung des Baltischen im Kreise der indogermanischen
 Sprachen. In Bernd Barschel, Maria Kozianka, and Karin Weber (eds.), *Indogermanisch,* Slawisch und Baltisch, Materialien des vom 21.-22. September 1989 in Jena in

Zusammenarbeit mit der Indogermanischen Gesellschaft durchgeführten Kolloquiums, Munich: Sagner, 201–222.

- Smith, Temple and Michael S. Waterman. 1981. Identification of common molecular subsequences. *Journal of Molecular Biology* 1: 195–197.
- Sokal, Robert and Charles Michener. 1958. A statistical method for evaluating systematic relationships. *University of Kansas Scientific Bulletin* 28: 1409–1438.

Somers, Harold L. 1998. Similarity metrics for aligning children's articulation data. In *Proceedings of COLING-ACL'98: 36th Annual Meeting of the Association for Computational Linguistics and 17th International Conference on Computational Linguistics*. Stroudsburg, PA: Associan for Computational Linguistics, 1227-1231.

- Stang, Christian. 1966. Vergleichende Grammatik der baltischen Sprachen. Oslo: Universitetsforlaget.
- Starostin, Stanley. 2000. Comparative linguistics and lexicostatistics. In Colin Renfrew, April
 McMahon, and Larry Trask (eds.), *Time depth in historical linguistics* vol. 1. Cambridge:
 McDonald Institute for Archaeological Research, 223–265.
- Steiner, Lydia, Peter F. Stadler, and Michael Cysouw. 2011. A pipeline for computational historical linguistics. *Language Dynamics and Change* 1(1): 89–127.
- Šturms, Eduard. 1960. Die baltisch-slavischen Beziehungen in vorgeschichtlicher Sicht. In Edite Hauzenberga-Šturma (ed), *In honorem Endzelini*. Chicago: Čikāgas Baltu Filologu Kopa, 149-155.
- Swadesh, Morris. 1955. Towards greater accuracy in lexicostatistic dating. *International Journal of American Linguistics* 21: 121–137.

- Trask, Robert Lawrence. 2000. *The dictionary of historical and comparative linguistics*. Edinburgh: Edinburgh University Press.
- Trautmann, Reinhold. 1923. *Baltisch-Slavisches Wörterbuch*. Göttingen: Vandenhoeck & Ruprecht.
- Turchin, Peter, Ilia Peiros, and Murray Gell-Mann. 2010. Analyzing genetic connections between languages by matching consonant classes. *Journal of Language Relationship* 3: 117–126.
- Vaillant, Andre. 1956. Communications. Séance du 5 mars 1954. *Bulletin de la Société de linguistique de Paris* 51. XXI–XXIII.
- Van Wijk, Nicolas. 1923. *Die Baltischen und Slavischen Akzent- und Intonationssysteme*. Amsterdam: Mouton.
- Wagner, Robert A. and Michael J. Fischer. 1974. The string-to-string correction problem. Journal of the Association for Computing Machinery 21(1): 168-173.
- Warnow, Tandy. 1997. Mathematical approaches to comparative linguistics. *PNAS* 94: 6585–6590.
- Whitfield, John. 2008. Across the curious parallel of language and species evolution. *PLoS Biology* 6: e186.
- Winter, Werner. 1978. The distribution of short and long vowels in stems of the type Lith. *ésti:* vèsti : mèsti and OCS jasti : vesti : mesti in Baltic and Slavic Languages. In Jacek Fisiak (ed.), Recent Developments in Historical Phonology. The Hague: Mouton, 431–446.

APPENDIX A

BALTO-SLAVIC WORDLISTS

CONCEPT	WORD	Language
all	us ^j e	Belarusian
all	fsitſki	Bulgarian
all	f∫ıxpı	Czech
all	kòżdi	Kashubian
all	visi	Latvian
all	viskas	Lithuanian
all	visi	Lithuanian
all	w§ε	LowerSorbian
all	site	Macedonian
all	vĭsi	OldChurchSlavic
all	wissay	OldPrussian
all	fşəstsə	Polish
all	vs ^j e	Russian
all	svî	SerboCroatian
all	fſɛttsi	Slovak
all	msi	Slovenian
all	vsi	Ukrainian
all	w∫ī	UpperSorbian
and	i	Belarusian
and	i	Bulgarian
and	а	Czech
and	ë	Kashubian
and	ùn	Latvian
and	ir	Lithuanian
and	а	LowerSorbian
and	i	Macedonian
and	i	OldChurchSlavic
and	bhe	OldPrussian
and	i	Polish
and	i	Russian
and	i	SerboCroatian

and	a	Slovak
and	in	Slovenian
and	i	Ukrainian
and	a	UpperSorbian
animal	ziviota	Belarusian
animal	zivətnu	Bulgarian
animal	zviːŗɛ	Czech
animal	zwiérz	Kashubian
animal	dzîvnieks	Latvian
animal	zvērs	Latvian
animal	kustonis	Latvian
animal	gyvulys	Lithuanian
animal	žvėris	Lithuanian
animal	zwır ^j ɛ	LowerSorbian
animal	zivətnə	Macedonian
animal	zivətŭ	OldChurchSlavic
animal	zværĭ	OldChurchSlavic
animal	swīrins	OldPrussian
animal	alne	OldPrussian
animal	zvjeze	Polish
animal	zivotnoje	Russian
animal	3ivŏtina	SerboCroatian
animal	zviera	Slovak
animal	zivă:w	Slovenian
animal	tvarına	Ukrainian
animal	ZWIR ^j O	UpperSorbian
ant	muraşka	Belarusian
ant	mravka	Bulgarian
ant	mravenets	Czech
ant	mroja	LowerSorbian
ant	mravka	Macedonian
ant	mravĭjĭ	OldChurchSlavic

antmuraviejRussianantmrâ·vSerboCroatianantmravetsSlovakantmră·vljaSlovenianantmuraxaUkrainianantmrojaUpperSorbianashespòpiółKashubianashespopiełBelarusianashespopiełBelarusianashespopiełCzechashespepiLatvianashespopiełLowerSorbianashespopiełOldChurchSlavicashespepelOldChurchSlavicashespepiłaSlovakashespopiłaSlovakashespopiłaNacedonianashespopiłaOldChurchSlavicashespepiłaSlovakashespopiłaSlovakashespopiłaSlovakashespopiłaSlovakashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianatnaBelarusianatnaBulgarianatnaCzechatnaCzechatpieLatvian	ant	mruvka	Polish
antmrâ:vSerboCroatianantmravetsSlovakantmră:vljaSlovenianantmuraxaUkrainianantmrojaUpperSorbianashespòpiółKashubianashespopiełBelarusianashespopelCzechashespepełBulgarianashespelenaiLithuanianashespopeloOldChurchSlavicashespopeloOldChurchSlavicashespepeloOldChurchSlavicashespopijuwPolishashespopiłSerboCroatianashespopiłSlovakashespopiłUkrainianashespopiłwPolishashespopiłSlovakashespopiłSlovakashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłSlovakashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianatnaBelarusianatnaBulgarianatnaCzechatnaCzechatpièKashubianatpièKashubianatpièLatvian	ant	murav ^j ɛj	Russian
antmravetsSlovakantmră·vljaSlovenianantmuraxaUkrainianantmrojaUpperSorbianashespòpiółKashubianashespopiełBelarusianashespopiełBulgarianashespopelCzechashespelniLatvianashespopelCzechashespelenaiLithuanianashespopel0OldChurchSlavicashespopel0OldChurchSlavicashespepel0OldChurchSlavicashespepel0SlovakashespopiłVersorbianashespopiłOldPrussianashespopiłVersianashespopiłSlovakashespopiłSlovakashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianashespopiłUkrainianatnaBelarusianatveCzechatnaCzechatpieLatvian	ant	mrâ:v	SerboCroatian
antmră:vljaSlovenianantmuraxaUkrainianantmrojaUpperSorbianashespòpiółKashubianashespopletBelarusianashespepołBulgarianashespopelCzechashespelniLatvianashespopelMacedonianashespopelůOldChurchSlavicashespepelůOldChurchSlavicashespepelůOldChurchSlavicashespopjevevPolishashespopojSlovakashespopitSlovakashespopitUkrainianashespopitVurainianashespopitUkrainianashespopitUkrainianashespopitSlovakashespopěevSlovakashespopěevSlovakashespopěevSlovakashespopěevSlovakashespopěevSlovakashespopěevUpperSorbianatnaBelarusianatnaBulgarianatnaBulgarianatnaCzechatnaCzechatnaCzechatnaprzěatprzěKashubianatprzěKashubianatprzěKashubianatprzéKashubianatprzéKashubianatp	ant	mravets	Slovak
antmuraxaUkrainianantmrojaUpperSorbianashespòpiółKashubianashespopiełBelarusianashespepəłBulgarianashespepəłBulgarianashespepelCzechashespeleniLatvianashespelenaiLithuanianashespopēewLowerSorbianashespepelMacedonianashespepelðOldChurchSlavicashespepelðOldChurchSlavicashespepelðOldPrussianashespopjuwPolishashespôpöewSlovakashespepelSlovakashespopiłUkrainianashespopěewUpperSorbianatnaBelarusianatnaBelarusianatnaBulgarianatv<	ant	mră:vlja	Slovenian
antmrojaUpperSorbianashespòpiółKashubianashespopiełBelarusianashespepełBulgarianashespopelCzechashespeleniLatvianashespelenaiLithuanianashespopelMacedonianashespopelůOldChurchSlavicashespepelůOldChurchSlavicashespepelůOldChurchSlavicashespopjuwPolishashespopolSlovakashespipečevSlovakashespipečevSlovakashespopilUkrainianashespopěčwUpperSorbianashespopěčvSlovakashespipěčiSlovakashespopěčwUpperSorbianatnaBelarusianatnaBulgarianatv<	ant	muraxa	Ukrainian
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ashespopεlCzechashespelniLatvianashespelenaiLithuanianashespopěεwLowerSorbianashespepelMacedonianashespepelôOldChurchSlavicashespepelôOldChurchSlavicashespepelôOldChurchSlavicashespepelôOldChurchSlavicashespepelôSlovakashespepelôSerboCroatianashespôpêvSlovakashespôpê <w td="">SlovakashespopiłUkrainianashespopěewUpperSorbianatnaBelarusianatv<</w>	ashes	feq3q	Bulgarian
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ashespelenaiLithuanianashespopěεwLowerSorbianashespepεlMacedonianashespopelŏOldChurchSlavicashespepelŏOldChurchSlavicashespepelŏOldPrussianashespepeloOldPrussianashespopjuwPolishasheszəłaRussianashespôpeoSerboCroatianashespopjlSlovakashespopiłUkrainianashespopěεwSlovakashespopěewUpperSorbianatnaBelarusianatv <f< td="">BulgarianatvzCzechatpièLatvian</f<>	ashes	pelni	Latvian
ashespopěεwLowerSorbianashespepεlMacedonianashespopelŏOldChurchSlavicashespepelŏOldChurchSlavicashespepelŏOldPrussianashespopjuwPolishasheszołaRussianashespêpeoSerboCroatianashespopilSlovakashespopiłUkrainianashespopěεwUpperSorbianatnaBelarusianatv<	ashes	pelenai	Lithuanian
ashespepelMacedonianashespopelŏOldChurchSlavicashespepelŏOldChurchSlavicashespepelŏOldPrussianashespopjuwPolishasheszołaRussianashespêpeoSerboCroatianashespopiłSlovakashespopiłUkrainianashespopěčwSlovenianashespopěčwUpperSorbianatnaBelarusianatvεCzechatnaCzechatpřečKashubianatpřečKashubianatpřečKashubian	ashes	popĕɛw	LowerSorbian
ashespopelŏOldChurchSlavicashespεpelŏOldChurchSlavicashespelanneOldPrussianashespopjuwPolishasheszołaRussianashespêpɛɔSerboCroatianashespopjlSlovakashespopiłUkrainianashespopěɛwUpperSorbianatnaBelarusianatvrfBulgarianatvεCzechatprzëKashubianatpièLatvian	ashes	pepɛl	Macedonian
ashespεpelŏOldChurchSlavicashespelanneOldPrussianashespopjuwPolishasheszołaRussianasheszołaRussianashespêpeoSerboCroatianashespopolSlovakashespepě:wSlovenianashespopiłUkrainianashespopiřUkrainianashespopěεwUpperSorbianatnaBelarusianatvrfBulgarianatveCzechatnaCzechatpièLatvian	ashes	pəpɛlŭ	OldChurchSlavic
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	at	pìe	Latvian

at	UZ	Latvian
at	į	Lithuanian
at	pas	Lithuanian
at	prie	Lithuanian
at	wε	LowerSorbian
at	na	LowerSorbian
at	və	Macedonian
at	na	Macedonian
at	vŏ	OldChurchSlavic
at	na	OldChurchSlavic
at	prēi	OldPrussian
at	na	Polish
at	vε	Polish
at	na	Russian
at	v	Russian
at	na	SerboCroatian
at	u	SerboCroatian
at	na	Slovak
at	və	Slovak
at	v	Slovenian
at	na	Slovenian
at	na	Ukrainian
at	υ	Ukrainian
at	na	UpperSorbian
at	Wε	UpperSorbian
back	sp ^j ina	Belarusian
back	grvb	Bulgarian
back	za:da	Czech
back	plecë	Kashubian
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back	keebjat	LowerSorbian

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bark	kóra	Kashubian
bark	miza	Latvian
bark	žievė	Lithuanian
bark	şkəra	LowerSorbian
bark	kora	Macedonian
bark	kəra	OldChurchSlavic
bark	saxtis	OldPrussian
bark	kəra	Polish
bark	kəra	Russian
bark	kôra	SerboCroatian
bark	kuəra	Slovak
bark	skŏ:rja	Slovenian
bark	kəra	Ukrainian
bark	skora	UpperSorbian
because	bo	Belarusian
because	zə∫tətu	Bulgarian
because	protoze	Czech
because	bò	Kashubian
because	tàdẽļka	Latvian
because	tàpêcka	Latvian
because	kadangi	Lithuanian
because	todėl	Lithuanian
because	dəkul ^j aş	LowerSorbian
because	bidejci	Macedonian
because	zatoa∫to	Macedonian
because	p၁ɲɛʒɛ	OldChurchSlavic
because	Ζαμεζε	OldChurchSlavic
because	beggi	OldPrussian
because	bo	Polish
because	pətəmuştə	Russian
because	zăto:∫to	SerboCroatian

because	jêr	SerboCroatian
because	Ιεbo	Slovak
because	pretoze	Slovak
because	ker	Slovenian
because	tomuştşo	Ukrainian
because	dəkɛl∫	UpperSorbian
belly	zivot	Belarusian
belly	kurem	Bulgarian
belly	bŗıxə	Czech
belly	brzëch	Kashubian
belly	vệdẹrs	Latvian
belly	pilvas	Lithuanian
belly	br ^j ux	LowerSorbian
belly	mev	Macedonian
belly	∯rævo	OldChurchSlavic
belly	weders	OldPrussian
belly	bzux	Polish
belly	zįvot	Russian
belly	tř:bux	SerboCroatian
belly	bruxo	Slovak
belly	trě:bux	Slovenian
belly	zīvit	Ukrainian
belly	brux	UpperSorbian
big	v ^j al ^j ik ^j i	Belarusian
big	gul ^j am	Bulgarian
big	velki:	Czech
big	wiôldżi	Kashubian
big	liẽls	Latvian
big	didelis	Lithuanian
big	wĕɛl ^j iki	LowerSorbian
big	golɛm	Macedonian
big	velikŏ	OldChurchSlavic

big	debīkan	OldPrussian
big	duze	Polish
big	bol ^j şəj	Russian
big	vělik	SerboCroatian
big	vel ^j ki:	Slovak
big	vê:lik	Slovenian
big	vełikij	Ukrainian
big	wulki	UpperSorbian
bird	ptuşka	Belarusian
bird	ptitsə	Bulgarian
bird	pta:k	Czech
bird	ptôch	Kashubian
bird	putns	Latvian
bird	paukštis	Lithuanian
bird	ptaşk	LowerSorbian
bird	ptitsa	Macedonian
bird	pŏtits ⁱ a	OldChurchSlavic
bird	pippalins	OldPrussian
bird	ptak	Polish
bird	pt ^j itsa	Russian
bird	ptîtsa	SerboCroatian
bird	fta:k	Slovak
bird	ptĭ:tsa	Slovenian
bird	ptax	Ukrainian
bird	ptat∫k	UpperSorbian
bite	grëzc	Kashubian
bite	kąsti	Lithuanian
bite	kusats ^j	Belarusian
bite	xap ^j ə	Bulgarian
bite	kousat	Czech
bite	kôž	Latvian
bite	kusac	LowerSorbian

bite	kasa	Macedonian
bite	gruisti	OldChurchSlavic
bite	xapati	OldChurchSlavic
bite	grəztc	Polish
bite	kusat ^j	Russian
bite	grîzti	SerboCroatian
bite	hri:zc	Slovak
bite	grĭ:zti	Slovenian
bite	kusatı	Ukrainian
bite	kusat∫	UpperSorbian
black	tşərni	Belarusian
black	t∫εrອn	Bulgarian
black	t∫εrni:	Czech
black	czôrny	Kashubian
black	męĨns	Latvian
black	juodas	Lithuanian
black	tsarnə	LowerSorbian
black	tsərn	Macedonian
black	ţſŗ ^j nŭ	OldChurchSlavic
black	kirsnan	OldPrussian
black	tşarnş	Polish
black	t∫ərnij	Russian
black	tsr:n	SerboCroatian
black	t∫ierni	Slovak
black	t∫ð:rn	Slovenian
black	tşərnıj	Ukrainian
black	t∫ornș	UpperSorbian
blood	krow	Belarusian
blood	krvv	Bulgarian
blood	kref	Czech
blood	krew	Kashubian
blood	asins	Latvian

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count	broi	Macedonian
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day	dzéń	Kashubian
day	dìena	Latvian
day	diena	Lithuanian
day	zen	LowerSorbian
day	den	Macedonian
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day	deinan	OldPrussian
day	dzen	Polish
day	d ^j en ^j	Russian
day	dâ:n	SerboCroatian
day	յեն	Slovak
day	dâ:n	Slovenian
day	denj	Ukrainian
day	dʒen	UpperSorbian
die	ùmierac	Kashubian
die	mirti	Lithuanian
die	pam ^j irats ^j	Belarusian
die	umirəm	Bulgarian
die	umi:rat	Czech
die	mir̃st	Latvian
die	dvėsti	Lithuanian
die	mr ^j I¢	LowerSorbian
die	umiram	Macedonian
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dig	kasti	Lithuanian
dig	kapats ^j	Belarusian
dig	kupajə	Bulgarian
dig	kəpat	Czech
dig	ròk	Latvian
dig	rəc	LowerSorbian
dig	kopa	Macedonian
dig	kəpati	OldChurchSlavic
dig	rawas	OldPrussian
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dog	kut∫9	Bulgarian
dog	pes	Czech
dog	pies	Kashubian
dog	suns	Latvian
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dog	šunis	Lithuanian
dog	šuva	Lithuanian
dog	pjas	LowerSorbian
dog	kut∫ε	Macedonian
dog	pĭsŏ	OldChurchSlavic
dog	sunis	OldPrussian
dog	pjɛs	Polish
dog	sabaka	Russian
dog	pâs	SerboCroatian
dog	pɛs	Slovak
dog	pəs	Slovenian
dog	sobaka	Ukrainian
dog	pes	Ukrainian
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dull	atšipęs	Lithuanian
dull	tupș	LowerSorbian
dull	tap	Macedonian
dull	tõpŭ	OldChurchSlavic
dull	tɛmpə	Polish
dull	tupoj	Russian
dull	tû:p	SerboCroatian
dull	tupi:	Slovak
dull	təp	Slovenian
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earth z ^j ɛml ^j a Russian	earth	zemja	Polish
	earth	z ^j ɛml ^j a	Russian

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earth	zĕmʎa	SerboCroatian
earth	zεm	Slovak
earth	zêːmlja	Slovenian
earth	zɛmlʲa	Ukrainian
earth	zemja	UpperSorbian
eat	jesc	Kashubian
eat	valgyti	Lithuanian
eat	jɛsʲtsʲi	Belarusian
eat	jam	Bulgarian
eat	ji:st	Czech
eat	ệd	Latvian
eat	jīste	LowerSorbian
eat	jade	Macedonian
eat	jasti	OldChurchSlavic
eat	īst	OldPrussian
eat	wolgeit	OldPrussian
eat	jeete	Polish
eat	jes ^j t ^j	Russian
eat	jêsti	SerboCroatian
eat	jesc	Slovak
eat	jě:sti	Slovenian
eat	jistı	Ukrainian
eat	jıst∫	UpperSorbian
egg	jajka	Belarusian
egg	jəjtse	Bulgarian
egg	vejtse	Czech
egg	jajco	Kashubian
egg	õla	Latvian
egg	kiaušinis	Lithuanian
egg	jajo	LowerSorbian
egg	jajtse	Macedonian
egg	ajĭts ⁱ e	OldChurchSlavic

egg	paute	OldPrussian
egg	jajko	Polish
egg	jajtso	Russian
egg	jăːjɛ	SerboCroatian
egg	vajtse	Slovak
egg	jă:jtsɛ	Slovenian
egg	jajtse	Ukrainian
egg	jeo	UpperSorbian
eye	voka	Belarusian
eye	uko	Bulgarian
eye	əkə	Czech
eye	òkò	Kashubian
eye	acs	Latvian
eye	akis	Lithuanian
eye	həkə	LowerSorbian
eye	okə	Macedonian
eye	oko	OldChurchSlavic
eye	ackis	OldPrussian
eye	əkə	Polish
eye	głaz	Russian
eye	ôkə	SerboCroatian
eye	əkə	Slovak
eye	əkô:	Slovenian
eye	əkə	Ukrainian
eye	woko	UpperSorbian
fall	pôdac	Kashubian
fall	kristi	Lithuanian
fall	padats ^j	Belarusian
fall	padəm	Bulgarian
fall	padat	Czech
fall	krìt	Latvian
fall	pulti	Lithuanian
fall	padac	LowerSorbian

fall	pala	Macedonian
	P-9-	
fall	padati	OldChurchSlavic
fall	krūt	OldPrussian
fall	spadate	Polish
fall	padat ^j	Russian
fall	pâdati	SerboCroatian
fall	padac	Slovak
fall	pă:sti	Slovenian
fall	padatı	Ukrainian
fall	padat∫	UpperSorbian
far	dal ^j oka	Belarusian
far	dəlɛt∫ə	Bulgarian
far	daleko	Czech
far	daleczi	Kashubian
far	tâlu	Latvian
far	tolimas	Lithuanian
far	dal ^j oko	LowerSorbian
far	daleku	Macedonian
far	dalεt∫ε	OldChurchSlavic
far	daleko	Polish
far	dal ^j eko	Russian
far	dalěkə	SerboCroatian
far	Jaleko	Slovak
far	dă:lɛt∫	Slovenian
far	dałeko	Ukrainian
far	daləkə	UpperSorbian
fat	tłusts	Belarusian
fat	məznina	Bulgarian
fat	tuk	Czech
fat	tłëst	Kashubian
fat	tàuki	Latvian

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fat	tutsne	LowerSorbian
fat	mast	Macedonian
fat	tukŏ	OldChurchSlavic
fat	takis	OldPrussian
fat	instran	OldPrussian
fat	mynsis	OldPrussian
fat	twuştş	Polish
fat	zir	Russian
fat	mâ:st	SerboCroatian
fat	tuk	Slovak
fat	mâ:st	Slovenian
fat	zır	Ukrainian
fat	tuk	UpperSorbian
father	bats ^j ka	Belarusian
father	bə∫ta	Bulgarian
father	otets	Czech
father	òjc	Kashubian
father	tę̃vs	Latvian
father	tėvas	Lithuanian
father	nan	LowerSorbian
father	tatko	Macedonian
father	ətĭts ⁱ ĭ	OldChurchSlavic
father	tāwas	OldPrussian
father	ojteets	Polish
father	ot ^j ets	Russian
father	ŏtats	SerboCroatian
father	ocets	Slovak
father	ð:t∫ε	Slovenian
father	bat ^j kə	Ukrainian
father	nan	UpperSorbian
fear	bòjecsã	Kashubian
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fear	bijoti	Lithuanian
fear	bajatstsa	Belarusian
fear	strəxuvəmse	Bulgarian
fear	bujrse	Bulgarian
fear	pła∫əsɛ	Bulgarian
fear	ba:tsɛ	Czech
fear	baĩdâs	Latvian
fear	bîstas	Latvian
fear	bejaese	LowerSorbian
fear	plasise	Macedonian
fear	bojatisẽ	OldChurchSlavic
fear	bia	OldPrussian
fear	bijatwei	OldPrussian
fear	batece	Polish
fear	bəjat ⁱ s ⁱ a	Russian
fear	bðjatise	SerboCroatian
fear	plâ∫itisε	SerboCroatian
fear	ba:csa	Slovak
fear	bă:tise	Slovenian
fear	bəjatıs ⁱ a	Ukrainian
fear	bojεt∫so	UpperSorbian
feather	p ^j arə	Belarusian
feather	pərə	Bulgarian
feather	pɛːrɔ	Czech
feather	pióro	Kashubian
feather	spaĨva	Latvian
feather	plunksna	Lithuanian
feather	pĕɛrɔ	LowerSorbian
feather	pero	Macedonian
feather	рєгэ	OldChurchSlavic
feather	plāugzā	OldPrussian

feather	pjurə	Polish
feather	p ^j ero	Russian
feather	pěro	SerboCroatian
feather	рего	Slovak
feather	perô:	Slovenian
feather	рего	Ukrainian
feather	рёггэ	UpperSorbian
few	mała	Belarusian
few	małku	Bulgarian
few	ma:lo	Czech
few	mało	Kashubian
few	druksu	Latvian
few	mazi	Latvian
few	nedaug	Lithuanian
few	mawo	LowerSorbian
few	malku	Macedonian
few	malə	OldChurchSlavic
few	mazāiz	OldPrussian
few	mawo	Polish
few	mało	Russian
few	mâlə	SerboCroatian
few	ma:lo	Slovak
few	mă:lə	Slovenian
few	mało	Ukrainian
few	mawo	UpperSorbian
fight	biôtkòwac	Kashubian
fight	kovoti	Lithuanian
fight	bitstsa	Belarusian
fight	zmayatsta	Belarusian
fight	bər ^j əse	Bulgarian
fight	zapasit	Czech
fight	bi:tsɛ	Czech
fight	bojovat	Czech
fight	cìnâs	Latvian

fight	kaûjas	Latvian
fight	sisties	Latvian
fight	wəjowac	LowerSorbian
fight	biese	LowerSorbian
fight	borise	Macedonian
fight	bratisẽ	OldChurchSlavic
fight	ūlint	OldPrussian
fight	valtşətc	Polish
fight	bitece	Polish
fight	drat ^j s ^j a	Russian
fight	bərət ^j s ^j a	Russian
fight	bŏritise	SerboCroatian
fight	bojovac	Slovak
fight	bicsa	Slovak
fight	bojevă:tise	Slovenian
fight	borotīs ^j a	Ukrainian
fight	wojoat∫	UpperSorbian
fight	bit∫sə	UpperSorbian
fingernail	nəyats ^j	Belarusian
fingernail	nəkət	Bulgarian
fingernail	nɛĥɛt	Czech
fingernail	paznokc	Kashubian
fingernail	nags	Latvian
fingernail	nagas	Lithuanian
fingernail	noke	LowerSorbian
fingernail	nokət	Macedonian
fingernail	nəgŭtĭ	OldChurchSlavic
fingernail	nagutis	OldPrussian
fingernail	paznok ⁱ ete	Polish
fingernail	nəgət ^j	Russian
fingernail	nôkat	SerboCroatian

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fishrọbaLowerSorbianfishribaMacedonianfishruubaOldChurchSlavicfishsuckansOldPrussianfishrọbaPolish	fish	žuvis	Lithuanian
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fish suckans OldPrussian fish r9ba Polish	fish	ruba	OldChurchSlavic
fish rọba Polish	fish	suckans	OldPrussian
	fish	rəba	Polish

fish	riba	Russian
fish	rîba	SerboCroatian
fish	riba	Slovak
fish	rĭ:ba	Slovenian
fish	rība	Ukrainian
fish	кэ́ba	UpperSorbian
five	p ^j ats ^j	Belarusian
five	pɛt	Bulgarian
five	pjɛt	Czech
five	piãc	Kashubian
five	pìeci	Latvian
five	penki	Lithuanian
five	ріє	LowerSorbian
five	pet	Macedonian
five	pẽtĭ	OldChurchSlavic
five	piēcts	OldPrussian
five	pjente	Polish
five	p ^j at ^j	Russian
five	pê:t	SerboCroatian
five	pæc	Slovak
five	pê:t	Slovenian
five	pjat ^j	Ukrainian
five	pĕɛt∫	UpperSorbian
float	płëwac	Kashubian
float	plaukti	Lithuanian
float	płavats ^j	Belarusian
float	płavəm	Bulgarian
float	plout	Czech
float	pludõ	Latvian
float	pl ^j iwac	LowerSorbian
float	plovi	Macedonian
float	plavati	OldChurchSlavic

float	pluti	OldChurchSlavic
float	pwəvatc	Polish
float	płavat ^j	Russian
float	plŭtati	SerboCroatian
float	pla:vac	Slovak
float	plâ:vati	Slovenian
float	płavatı	Ukrainian
float	pʰuwat∫	UpperSorbian
flow	płënąc	Kashubian
flow	tekėti	Lithuanian
flow	ts ^j atşi	Belarusian
flow	təkr	Bulgarian
flow	tɛ:tst	Czech
flow	plûst	Latvian
flow	tęk	Latvian
flow	bızac	LowerSorbian
flow	tet∫ε	Macedonian
flow	tε∫ti	OldChurchSlavic
flow	tektweī	OldPrussian
flow	pwənənte	Polish
flow	t ^j ɛt∫	Russian
flow	têtci	SerboCroatian
flow	cietsc	Slovak
flow	tê:t∫i	Slovenian
flow	tektı	Ukrainian
flow	beʒɛt∫	UpperSorbian
flower	kv ^j ɛtka	Belarusian
flower	tsvetə	Bulgarian
flower	kvjet	Czech
flower	kwiat	Kashubian
flower	ziêds	Latvian
flower	puķe	Latvian
flower	gėlė	Lithuanian

flower	žiedas	Lithuanian
flower	kwitk	LowerSorbian
flower	tsvece	Macedonian
flower	ts ^j vætŏ	OldChurchSlavic
flower	kfjat	Polish
flower	tsv ^j ɛt	Russian
flower	tsvjê:t	SerboCroatian
flower	kvet	Slovak
flower	tsvê:t	Slovenian
flower	kvitka	Ukrainian
flower	kwitka	UpperSorbian
fly	lôtac	Kashubian
fly	skristi	Lithuanian
fly	l ^j ats ^j ɛts ^j	Belarusian
fly	lət ⁱ x	Bulgarian
fly	lecet	Czech
fly	lidot	Latvian
fly	laîžas	Latvian
fly	skrìen	Latvian
fly	lėkti	Lithuanian
fly	lecec	LowerSorbian
fly	leta	Macedonian
fly	letæti	OldChurchSlavic
fly	skreītwei	OldPrussian
fly	letcetc	Polish
fly	ljetjetj	Russian
fly	lětjeti	SerboCroatian
fly	leciec	Slovak
fly	letě:ti	Slovenian
fly	łet ^j itı	Ukrainian
fly	letʃɛtʃ	UpperSorbian
fog	tuman	Belarusian

fog	məgla	Bulgarian
fog	mļĥa	Czech
fog	dôka	Kashubian
fog	migla	Latvian
fog	rūkas	Lithuanian
fog	migla	Lithuanian
fog	kur ^j awa	LowerSorbian
fog	magla	Macedonian
fog	mĭgla	OldChurchSlavic
fog	kupsins	OldPrussian
fog	mgwa	Polish
fog	tuman	Russian
fog	măgla	SerboCroatian
fog	ĥmla	Slovak
fog	məgla	Slovenian
fog	tuman	Ukrainian
fog	kurjawa	UpperSorbian
foot	naya	Belarusian
foot	krak	Bulgarian
foot	noĥa	Czech
foot	stopa	Kashubian
foot	kãja	Latvian
foot	pėda	Lithuanian
foot	noqa	LowerSorbian
	5	LowerSorbian
foot	noga	Macedonian
foot foot	noga noga	Macedonian OldChurchSlavic
foot foot foot	noga noga nage	Macedonian OldChurchSlavic OldPrussian
foot foot foot foot	noga noga nage noga	Macedonian OldChurchSlavic OldPrussian Polish
foot foot foot foot foot	noga noga nage noga noga	Macedonian OldChurchSlavic OldPrussian Polish Russian
foot foot foot foot foot	noga noga nage noga noga nŏga	Macedonian OldChurchSlavic OldPrussian Polish Russian SerboCroatian
foot foot foot foot foot foot foot	noga noga nage noga noga nŏga noĥa	Lowersorbian Macedonian OldChurchSlavic OldPrussian Polish Russian SerboCroatian Slovak

foot	noĥa	Ukrainian
foot	nəha	UpperSorbian
four	tşatiri	Belarusian
four	t∫εtiri	Bulgarian
four	t∫tıŗı	Czech
four	sztërë	Kashubian
four	četri	Latvian
four	keturi	Lithuanian
four	stər ^j i	LowerSorbian
four	t∫etiri	Macedonian
four	ffetture	OldChurchSlavic
four	kettwirts	OldPrussian
four	tşterə	Polish
four	t∫ɛtɨrʲi	Russian
four	t∫ĕtiri	SerboCroatian
four	∫tiri	Slovak
four	∫tĭːri	Slovenian
four	tşətiri	Ukrainian
four	∫tọri	UpperSorbian
freeze	miarznąc	Kashubian
freeze	šalti	Lithuanian
freeze	zam ^j arzats ^j	Belarusian
freeze	zəmryzvəm	Bulgarian
freeze	mŗznout	Czech
freeze	saÎst	Latvian
freeze	marznuc	LowerSorbian
freeze	mərzne	Macedonian
freeze	mŗznõti	OldChurchSlavic
freeze	zamarzate	Polish
freeze	zam ^j erzat ^j	Russian
freeze	smîznuti	SerboCroatian
freeze	mŗznuc	Slovak

freeze	mă:rzniti	Slovenian
freeze	zamerzatı	Ukrainian
freeze	mĕɛrznət∫	UpperSorbian
fruit	płəd	Belarusian
fruit	płəd	Bulgarian
fruit	pləd	Czech
fruit	brzôd	Kashubian
fruit	aûglis	Latvian
fruit	vaisius	Lithuanian
fruit	pwod	LowerSorbian
fruit	plod	Macedonian
fruit	plədŏ	OldChurchSlavic
fruit	wēisin	OldPrussian
fruit	ovots	Polish
fruit	płod	Russian
fruit	plô:d	SerboCroatian
fruit	pləd	Slovak
fruit	plô:d	Slovenian
fruit	pl ^j id	Ukrainian
fruit	pwod	UpperSorbian
full	powni	Belarusian
full	prlən	Bulgarian
full	pļni:	Czech
full	fùl	Kashubian
full	piĨns	Latvian
full	pilnas	Lithuanian
full	kupinas	Lithuanian
full	pownę	LowerSorbian
full	poln	Macedonian
full	pļnŏ	OldChurchSlavic
full	pilnan	OldPrussian
full	pɛwnə	Polish

full	połnij	Russian
full	pûn	SerboCroatian
full	pļni:	Slovak
full	pô:wn	Slovenian
full	povnij	Ukrainian
full	ponș	UpperSorbian
give	dôwac	Kashubian
give	duoti	Lithuanian
give	davats ^j	Belarusian
give	davəm	Bulgarian
give	da:vat	Czech
give	dôd	Latvian
give	dac	LowerSorbian
give	dade	Macedonian
give	dati	OldChurchSlavic
give	dāst	OldPrussian
give	davate	Polish
give	davat ^j	Russian
give	dâti	SerboCroatian
give	dac	Slovak
give	dă:ti	Slovenian
give	davatı	Ukrainian
give	dat∫	UpperSorbian
good	dəbri	Belarusian
good good	dəbr i dubvr	Belarusian Bulgarian
good good good	dəbri dubyr dəbri:	Belarusian Bulgarian Czech
good good good good	dəbr i dubyr dəbri: dobri	Belarusian Bulgarian Czech Kashubian
good good good good good	dəbri dubyr dəbri: dobri labs	Belarusian Bulgarian Czech Kashubian Latvian
good good good good good good	dəbri dubyr dəbri: dobri labs geras	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian
good good good good good good good	dəbri dubvr dəbri: dobri labs geras labas	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian Lithuanian
good good good good good good good good	dəbri dubvr dəbri: dobri labs geras labas	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian Lithuanian LowerSorbian

good	dəbrŭ	OldChurchSlavic
good	labs	OldPrussian
good	dobrə	Polish
good	xarəşij	Russian
good	dôbar	SerboCroatian
good	dəbri:	Slovak
good	dŏ:bər	Slovenian
good	xərəşij	Ukrainian
good	dəbrə	UpperSorbian
grass	trava	Belarusian
grass	trəva	Bulgarian
grass	traːva	Czech
grass	trôwa	Kashubian
grass	zâle	Latvian
grass	žolė	Lithuanian
grass	tşawa	LowerSorbian
grass	treva	Macedonian
grass	trava	OldChurchSlavic
grass	schokis	OldPrussian
grass	trava	Polish
grass	trava	Russian
grass	tră:va	SerboCroatian
grass	tra:va	Slovak
grass	tră:va	Slovenian
grass	trava	Ukrainian
grass	trawa	UpperSorbian
green	z ^j al ^j oni	Belarusian
green	zəlɛn	Bulgarian
green	zeleni:	Czech
green	zelony	Kashubian
green	zaļš	Latvian
green	žalias	Lithuanian

green	zɛlʲɛnə̯	LowerSorbian
green	zelɛn	Macedonian
green	zɛlɛnŭ	OldChurchSlavic
green	saligan	OldPrussian
green	zelonę	Polish
green	z ^j el ^j onij	Russian
green	zělen	SerboCroatian
green	zeleni:	Slovak
green	zelen	Slovenian
green	zełenij	Ukrainian
green	zɛlɛnə̯	UpperSorbian
guts	vantrobi	Belarusian
guts	vrtr∍∫nusti	Bulgarian
guts	vnıtřnosci	Czech
guts	brzëchòwina	Kashubian
guts	xar̂na	Latvian
guts	viduriai	Lithuanian
guts	žarnos	Lithuanian
guts	tsr ^j owa	LowerSorbian
guts	utroba	Macedonian
guts	õtroba	OldChurchSlavic
guts	grobis	OldPrussian
guts	vnentęnoetei	Polish
guts	vnutr ^j ennost ^j i	Russian
guts	ûtrəba	SerboCroatian
guts	vnutərnəsci	Slovak
guts	tſrevô:	Slovenian
guts	kışkı	Ukrainian
guts	t∫rewa	UpperSorbian
hair	vałasi	Belarusian

hair	kusa	Bulgarian
hair	vlası	Czech
hair	włosë	Kashubian
hair	mats	Latvian
hair	plaukai	Lithuanian
hair	WOSE	LowerSorbian
hair	kosa	Macedonian
hair	vlasi	OldChurchSlavic
hair	scebelis	OldPrussian
hair	vwəsə	Polish
hair	vəłəsi	Russian
hair	kŏsa	SerboCroatian
hair	vlasi	Slovak
hair	lâ:si	Slovenian
hair	vəłəs ⁱ sia	Ukrainian
hair	wəsə	UpperSorbian
hand	ruka	Belarusian
hand	rəka	Bulgarian
hand	ruka	Czech
hand	rãka	Kashubian
hand	ròka	Latvian
hand	ranka	Lithuanian
hand	ruka	LowerSorbian
hand	raka	Macedonian
hand	rõka	OldChurchSlavic
hand	rānkan	OldPrussian
hand	rɛŋka	Polish
hand	ruka	Russian
hand	rŭ:ka	SerboCroatian
hand	ruka	Slovak
hand	rô:ka	Slovenian
hand	ruka	Ukrainian

hand	ruka	UpperSorbian
he	jon	Belarusian
he	toj	Bulgarian
he	ən	Czech
he	òn	Kashubian
he	viņš	Latvian
he	jis	Lithuanian
he	wən	LowerSorbian
he	toj	Macedonian
he	jĭ	OldChurchSlavic
he	ənŭ	OldChurchSlavic
he	tŏ	OldChurchSlavic
he	tāns	OldPrussian
he	on	Polish
he	on	Russian
he	ô:n	SerboCroatian
he	on	Slovak
he	on	Slovenian
he	vin	Ukrainian
he	won	UpperSorbian
head	yałava	Belarusian
head	głəva	Bulgarian
head	ĥlava	Czech
head	głowa	Kashubian
head	gaÎva	Latvian
head	galva	Lithuanian
head	gwowa	LowerSorbian
head	glava	Macedonian
head	glava	OldChurchSlavic
head	gallū	OldPrussian
head	gwova	Polish

head	gəłəva	Russian
head	glǎ:va	SerboCroatian
head	ĥlava	Slovak
head	glă:va	Slovenian
head	həłəva	Ukrainian
head	woa	UpperSorbian
hear	czëc	Kashubian
hear	girdėti	Lithuanian
hear	tşuts ^j	Belarusian
hear	t∫uvəm	Bulgarian
hear	slı∫εt	Czech
hear	dzìrd	Latvian
hear	swəşac	LowerSorbian
hear	t∫uɛ	Macedonian
hear	sluu∫ati	OldChurchSlavic
hear	kīrdeiti	OldPrussian
hear	sw⊋∫εtc	Polish
hear	słişat ^j	Russian
hear	t∫ûti	SerboCroatian
hear	pət∫uc	Slovak
hear	slĭ:∫ati	Slovenian
hear	tşutı	Ukrainian
hear	swə∫ɛt∫	UpperSorbian
heart	sertsa	Belarusian
heart	sərtse	Bulgarian
heart	sṛtsɛ	Czech
heart	serce	Kashubian
heart	sirds	Latvian
heart	širdis	Lithuanian
heart	hutşəba	LowerSorbian
heart	sərtse	Macedonian
heart	sŗ ^j dĭts ^j ɛ	OldChurchSlavic

heart	sīran	OldPrussian
heart	sertse	Polish
heart	ajandtaa	Duccion
neart	sieralse	Kussian
heart	sŕtse	SerboCroatian
heart	sŗtsɛ	Slovak
heart	sərtsê:	Slovenian
heart	sertse	Ukrainian
heart	wutroba	UpperSorbian
heavy	ts ^j azk ^j i	Belarusian
heavy	tezək	Bulgarian
heavy	cε∫ki:	Czech
heavy	cãżczi	Kashubian
heavy	smags	Latvian
heavy	sunkus	Lithuanian
heavy	eızki	LowerSorbian
heavy	tezək	Macedonian
heavy	tẽʒĭkŭ	OldChurchSlavic
heavy	brendus	OldPrussian
heavy	tceũųzk ^j i	Polish
heavy	t ^j azəłij	Russian
heavy	tě:3ak	SerboCroatian
heavy	ca3ki:	Slovak
heavy	tê:3ək	Slovenian
heavy	t ^j azkıj	Ukrainian
heavy	t∫εʒki	UpperSorbian
here	tut	Belarusian
here	tuka	Bulgarian
here	tadı	Czech
here	tu	Kashubian
here	te	Latvian
here	šeĩt	Latvian
here	čia	Lithuanian
here	how	LowerSorbian

here	ovdɛ	Macedonian
here	tuka	Macedonian
here	sĭdɛ	OldChurchSlavic
here	schai	OldPrussian
here	tutaj	Polish
here	zdjesj	Russian
here	ŏ:vdjɛ	SerboCroatian
here	tu	Slovak
here	tu	Slovenian
here	tut	Ukrainian
here	tu	UpperSorbian
hit	ùderzëc	Kashubian
hit	mūšti	Lithuanian
hit	udarats ^j	Belarusian
hit	udr ^j əm	Bulgarian
hit	udeŗīt	Czech
hit	sit	Latvian
hit	dɛrʲiɕ	LowerSorbian
hit	udira	Macedonian
hit	udariti	OldChurchSlavic
hit	kyrteis	OldPrussian
hit	trīnktweī	OldPrussian
hit	udezate	Polish
hit	udar ^j at ^j	Russian
hit	ŭdariti	SerboCroatian
hit	ujeric	Slovak
hit	udă:rjati	Slovenian
hit	udar ^j atı	Ukrainian
hit	d⊋rit∫	UpperSorbian
hold	trzëmac	Kashubian
hold	laikyti	Lithuanian

hold	trimats ^j	Belarusian
hold	dər3x	Bulgarian
hold	drzet	Czech
hold	tur	Latvian
hold	zarzac	LowerSorbian
hold	dərʒi	Macedonian
hold	dr ^j zati	OldChurchSlavic
hold	lāiku	OldPrussian
hold	tşəmatc	Polish
hold	d ^j erzat ^j	Russian
hold	dřzati	SerboCroatian
hold	dŗʒac	Slovak
hold	dərʒă:ti	Slovenian
hold	derzatı	Ukrainian
hold	trimati	Ukrainian
hold	dӡεռӡεţ∫	UpperSorbian
horn	roγ	Belarusian
horn	rəg	Bulgarian
horn	rəh	Czech
horn	róg	Kashubian
horn	rags	Latvian
horn	ragas	Lithuanian
horn	rəg	LowerSorbian
horn	rog	Macedonian
horn	rəgŭ	OldChurchSlavic
horn	ragis	OldPrussian
horn	rug	Polish
horn	rəg	Russian
horn	rô:g	SerboCroatian
horn	rəh	Slovak
horn	rô:g	Slovenian
horn	r ^j ih	Ukrainian

horn	RÜ	UpperSorbian
		- FF
how	jak	Belarusian
how	kak	Bulgarian
how	jak	Czech
how	jak	Kashubian
how	kâ	Latvian
how	kaip	Lithuanian
how	kak	LowerSorbian
how	kako	Macedonian
how	kakə	OldChurchSlavic
how	kai	OldPrussian
how	jak	Polish
how	kak	Russian
how	kăko	SerboCroatian
how	ako	Slovak
how	kakŏ:	Slovenian
how	jak	Ukrainian
how	kak	UpperSorbian
hunt	jachtowac	Kashubian
hunt	medžioti	Lithuanian
hunt	pal ^j avats ^j	Belarusian
hunt	łuvuvəm	Bulgarian
hunt	ləvit	Czech
hunt	medĩ	Latvian
hunt	gəntwowac	LowerSorbian
hunt	lovi	Macedonian
hunt	loviti	OldChurchSlavic
hunt	medies	OldPrussian
hunt	polovate	Polish
hunt	axət ^j it ^j s ^j a	Russian
hunt	lðviti	SerboCroatian
	-	-

hunt	lovi:ti	Slovenian
hunt	pəl ^j uvatı	Ukrainian
hunt	hən ^j it∫	UpperSorbian
husband	muz	Belarusian
husband	mrz	Bulgarian
husband	manzel	Czech
husband	muz	Czech
husband	slëbny	Kashubian
husband	vĩrs	Latvian
husband	vyras	Lithuanian
husband	tswojek	LowerSorbian
husband	таз	Macedonian
husband	mõʒĭ	OldChurchSlavic
husband	wijrs	OldPrussian
husband	moщz	Polish
husband	muz	Russian
husband	mû:ʒ	SerboCroatian
husband	muz	Slovak
husband	manʒɛl	Slovak
husband	mô:3	Slovenian
husband	tşəłəvik	Ukrainian
husband	mu∫	UpperSorbian
Ι	ja	Belarusian
Ι	as	Bulgarian
Ι	ja:	Czech
Ι	jô	Kashubian
Ι	es	Latvian
Ι	aš	Lithuanian
Ι	ja	LowerSorbian
Ι	jas	Macedonian
I	azŭ	OldChurchSlavic
I	as	OldPrussian

Ι	ja	Polish
Ι	ja	Russian
Ι	jâː	SerboCroatian
Ι	ja	Slovak
Ι	jas	Slovenian
Ι	ja	Ukrainian
Ι	ja	UpperSorbian
ice	l ^j od	Belarusian
ice	lɛd	Bulgarian
ice	lɛd	Czech
ice	lód	Kashubian
ice	lędus	Latvian
ice	ledas	Lithuanian
ice	l ^j od	LowerSorbian
ice	mraz	Macedonian
ice	lɛdŭ	OldChurchSlavic
ice	ladis	OldPrussian
ice	lud	Polish
ice	l ^j od	Russian
ice	lê:d	SerboCroatian
ice	l ^j ad	Slovak
ice	lê:d	Slovenian
ice	l ^j id	Ukrainian
ice	lʊd	UpperSorbian
if	kal ^j i	Belarusian
if	əkə	Bulgarian
if	jɛstlı	Czech
if	jeżlë	Kashubian
if	ja	Latvian
if	jei	Lithuanian
if	kad	Lithuanian
if	gaş	LowerSorbian
if	ako	Macedonian

if	a∫tε	OldChurchSlavic
if	ickai	OldPrussian
if	jezeli	Polish
if	jesiliji	Russian
if	âkə	SerboCroatian
if	ak	Slovak
if	kɛbi	Slovak
if	akə	Slovenian
if	jakştşə	Ukrainian
if	∫ệb	UpperSorbian
in	u	Belarusian
in	vrf	Bulgarian
in	vε	Czech
in	w	Kashubian
in	iekš	Latvian
in	į	Lithuanian
in	in	Lithuanian
in	Wε	LowerSorbian
in	və	Macedonian
in	vŏ	OldChurchSlavic
in	ēn	OldPrussian
in	v	Polish
in	v	Russian
in	u	SerboCroatian
in	və	Slovak
in	v	Slovenian
in	υ	Ukrainian
in	wε	UpperSorbian
kill	zabijac	Kashubian
kill	užmušti	Lithuanian
kill	zab ^j ivats ^j	Belarusian
kill	ubivəm	Bulgarian
kill	zabi:jɛt	Czech

kill	nònâvẽ	Latvian
kill	zabic	LowerSorbian
kill	ubiva	Macedonian
kill	ubiti	OldChurchSlavic
kill	gallintwei	OldPrussian
kill	zabite	Polish
kill	ub ^j ivat ^j	Russian
kill	ŭbiti	SerboCroatian
kill	zabic	Slovak
kill	ubĭ:ti	Slovenian
kill	ubītī	Ukrainian
kill	zabit∫	UpperSorbian
knee	kal ^j ena	Belarusian
knee	kul ^j anu	Bulgarian
knee	kəlenə	Czech
knee	kòlano	Kashubian
knee	celis	Latvian
knee	kelis	Lithuanian
knee	kəl ^j ɛnɔ	LowerSorbian
knee	koleno	Macedonian
knee	kəlænə	OldChurchSlavic
knee	klupstis	OldPrussian
knee	kəlanə	Polish
knee	kal ^j eno	Russian
knee	kðljeno	SerboCroatian
knee	kəlenə	Slovak
knee	kəlě:nə	Slovenian
knee	kəl ^j inə	Ukrainian
knee	kəlenə	UpperSorbian
know	wiedzec	Kashubian
know	žinoti	Lithuanian
know	v ^j ɛdats ^j	Belarusian

know	znajə	Bulgarian
know	vjejet	Czech
know	zina	Latvian
know	wizec	LowerSorbian
know	znae	Macedonian
know	vædæti	OldChurchSlavic
know	waist	OldPrussian
know	vjedzete	Polish
know	znat ^j	Russian
know	znâti	SerboCroatian
know	vejiec	Slovak
know	vě:dɛti	Slovenian
know	znatı	Ukrainian
know	wedʒɛt∫	UpperSorbian
lake	vəz ^j era	Belarusian
lake	ezəru	Bulgarian
lake	jezero	Czech
lake	jezero	Kashubian
lake	ęzęrs	Latvian
lake	ežeras	Lithuanian
lake	jazər	LowerSorbian
lake	ezero	Macedonian
lake	jezero	OldChurchSlavic
lake	jezerŭ	OldChurchSlavic
lake	assaran	OldPrussian
lake	jezoro	Polish
lake	oz ⁱ ero	Russian
lake	jêzerə	SerboCroatian
lake	•	Slovak
laka	Jazero	Slovak
Таке	jazero jê:zero	Slovenian

lake	jizor	UpperSorbian
laugh	smiacsã	Kashubian
laugh	juoktis	Lithuanian
laugh	s ^j m ^j ajatstsa	Belarusian
laugh	smejəse	Bulgarian
laugh	sma:tsɛ	Czech
laugh	smejas	Latvian
laugh	smjaese	LowerSorbian
laugh	smeese	Macedonian
laugh	smijatisẽ	OldChurchSlavic
laugh	emjatece	Polish
laugh	sm ^j ɛjat ^j s ^j a	Russian
laugh	smĭjatise	SerboCroatian
laugh	smiacsa	Slovak
laugh	smejă:tise	Slovenian
laugh	smijatīs ^j a	Ukrainian
laugh	smĕɛt∫sɔ	UpperSorbian
leaf	lʲist	Belarusian
leaf	list	Bulgarian
leaf	lıst	Czech
leaf	lëst	Kashubian
leaf	lapa	Latvian
leaf	lapas	Lithuanian
leaf	wopĕɛnə	LowerSorbian
leaf	list	Macedonian
leaf	listŏ	OldChurchSlavic
leaf	lapan	OldPrussian
leaf	liete	Polish
leaf	l ^j ist	Russian
leaf	lî:st	SerboCroatian
leaf	list	Slovak
leaf	lî:st	Slovenian

leaf	łıst	Ukrainian
leaf	wəpĕɛnə	UpperSorbian
left	l ^j evi	Belarusian
left	ljav	Bulgarian
left	levi:	Czech
left	lewi	Kashubian
left	krèiss	Latvian
left	kairė	Lithuanian
left	lıwə	LowerSorbian
left	lev	Macedonian
left	∫yjĭ	OldChurchSlavic
left	lævŏ	OldChurchSlavic
left	įevą	Polish
left	l ^j evij	Russian
left	ljê:vi:	SerboCroatian
left	l ^j avi:	Slovak
left	lě:vi	Slovenian
left	l ^j ivıj	Ukrainian
left	iwə	UpperSorbian
leg	naya	Belarusian
leg	krak	Bulgarian
leg	nəĥa	Czech
leg	noga	Kashubian
leg	kãja	Latvian
leg	koja	Lithuanian
leg	noga	LowerSorbian
leg	noga	Macedonian
leg	nəga	OldChurchSlavic
leg	nage	OldPrussian
leg	nəga	Polish
leg	noga	Russian
leg	nŏga	SerboCroatian

leg	nəha	Slovak
leg	nô:ga	Slovenian
leg	nəha	Ukrainian
leg	nəa	UpperSorbian
lie	leżec	Kashubian
lie	gulti	Lithuanian
lie	l ^j azats ^j	Belarusian
lie	ləzr	Bulgarian
lie	lezet	Czech
lie	guļ	Latvian
lie	gulėti	Lithuanian
lie	l ^j azac	LowerSorbian
lie	lezi	Macedonian
lie	lezati	OldChurchSlavic
lie	lezete	Polish
lie	l ^j ezat ^j	Russian
lie	lězati	SerboCroatian
lie	lɛʒac	Slovak
lie	lɛʒăːti	Slovenian
lie	lezatı	Ukrainian
lie	leʒɛt∫	UpperSorbian
live	żëc	Kashubian
live	gyventi	Lithuanian
live	zits ^j	Belarusian
live	zivejə	Bulgarian
live	bıdlɛt	Czech
live	3i:t	Czech
live	dzîvõ	Latvian
live	gyvuoti	Lithuanian
live	zəwəbəc	LowerSorbian
live	bədlic	LowerSorbian
live	l ^j abowac	LowerSorbian
live	3 ίνεε	Macedonian
live	3iti	OldChurchSlavic
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live	giwa	OldPrussian
live	mjeşkate	Polish
live	zətc	Polish
live	zįtj	Russian
live	3ĭ:vjɛti	SerboCroatian
live	biːvac	Slovak
live	zic	Slovak
live	3ivě:ti	Slovenian
live	meşkatı	Ukrainian
live	zıtı	Ukrainian
live	bọdlit∫	UpperSorbian
live	ʒiwə́byt∫	UpperSorbian
liver	p ^j ɛtşan ^j	Belarusian
liver	t∫ɛrəndrəb	Bulgarian
liver	ja:tra	Czech
liver	wątroba	Kashubian
liver	aknas	Latvian
liver	kepenys	Lithuanian
liver	jītşa	LowerSorbian
liver	tsərndrob	Macedonian
liver	dziger	Macedonian
liver	jẽtrĭts ⁱ e	OldChurchSlavic
liver	jagno	OldPrussian
liver	vəntrəba	Polish
liver	p ^j εt∫εn ^j	Russian
liver	jêtra	SerboCroatian
liver	pεt∫εn	Slovak
liver	jě:tra	Slovenian
liver	petşinka	Ukrainian
liver	jatra	UpperSorbian
long	dəwy ^j i	Belarusian

long	drłəg	Bulgarian
long	dloufii:	Czech
long	dłudżi	Kashubian
long	garš	Latvian
long	ilgas	Lithuanian
long	dwujki	LowerSorbian
long	dolg	Macedonian
long	dļgŭ	OldChurchSlavic
long	ilgi	OldPrussian
long	dwug ^j i	Polish
long	dl ^j innij	Russian
long	dûg	SerboCroatian
long	dļhi:	Slovak
long	dð:wg	Slovenian
long	dəvhij	Ukrainian
long	doi	UpperSorbian
louse	yoş	Belarusian
louse	vr∫kə	Bulgarian
louse	vε∫	Czech
louse	wsza	Kashubian
louse	uts	Latvian
louse	utėlė	Lithuanian
louse	wεş	LowerSorbian
louse	vo∫ka	Macedonian
louse	νεş	Polish
louse	vəş	Russian
louse	û:∫	SerboCroatian
louse	və∫	Slovak
louse	û:∫	Slovenian
louse	υοşa	Ukrainian
louse	wo∫	UpperSorbian
man	muztşina	Belarusian
man	түз	Bulgarian

man	muz	Czech
man	vĩrs	Latvian
man	muski	LowerSorbian
man	таз	Macedonian
man	mõʒĭ	OldChurchSlavic
man	wijrs	OldPrussian
man	meũįstsຼəzna	Polish
man	muzt∫ina	Russian
man	mu∫kă∶rats	SerboCroatian
man	muz	Slovak
man	xlap	Slovak
man	t∫lô:vεk	Slovenian
man	tşəłəvik	Ukrainian
man	тиз	UpperSorbian
man	chłop	Kashubian
man	vyras	Lithuanian
man	człowiek	Kashubian
man	žmogus	Lithuanian
many	mnəya	Belarusian
many	mnəgu	Bulgarian
many	mnəhə	Czech
many	wiele	Kashubian
many	daũdzi	Latvian
many	daug	Lithuanian
many	wĕɛlʲɛ	LowerSorbian
many	mnogu	Macedonian
many	mŏnəgə	OldChurchSlavic
many	tūlan	OldPrussian
many	duzə	Polish
many	mnəgə	Russian
many	mnôgo	SerboCroatian
many	vel ^j a	Slovak

many	mnəhə	Slovak
many	mnô:go	Slovenian
many	baĥato	Ukrainian
many	wĕɛlɛ	UpperSorbian
meat	m ^j asa	Belarusian
meat	csem	Bulgarian
meat	maso	Czech
meat	miãso	Kashubian
meat	gaļa	Latvian
meat	mėsa	Lithuanian
meat	misə	LowerSorbian
meat	meso	Macedonian
meat	mẽsə	OldChurchSlavic
meat	mensā	OldPrussian
meat	mjeũįso	Polish
meat	m ^j aso	Russian
meat	mêːsə	SerboCroatian
meat	mæso	Slovak
meat	mesô:	Slovenian
meat	mjaso	Ukrainian
meat	mjasə	UpperSorbian
moon	m ^j ɛs ^j ats	Belarusian
moon	łuna	Bulgarian
moon	mpɛsiːts	Czech
moon	miesądz	Kashubian
moon	mẽness	Latvian
moon	mėnulis	Lithuanian
moon	mėnesis	Lithuanian
moon	mėnuo	Lithuanian
moon	mjasets	LowerSorbian
moon	mɛsetʃina	Macedonian
moon	mæsẽtsʲĭ	OldChurchSlavic

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moon	menig	OldPrussian
moon	kceũįzets	Polish
moon	łuna	Russian
moon	mjêse:ts	SerboCroatian
moon	mesiats	Slovak
moon	lŭ:na	Slovenian
moon	mê:sɛts	Slovenian
moon	mis ^j ats ^j	Ukrainian
moon	mısat∫k	UpperSorbian
mother	mats ^j i	Belarusian
mother	majkə	Bulgarian
mother	matka	Czech
mother	mëma	Kashubian
mother	mãte	Latvian
mother	motina	Lithuanian
mother	mac	LowerSorbian
mother	majka	Macedonian
mother	mati	OldChurchSlavic
mother	mūti	OldPrussian
mother	matka	Polish
mother	mat ^j	Russian
mother	mâ:jka	SerboCroatian
mother	matka	Slovak
mother	mă:ti	Slovenian
mother	matı	Ukrainian
mother	mat∫	UpperSorbian
mountain	yara	Belarusian
mountain	płənina	Bulgarian
mountain	ĥora	Czech
mountain	góra	Kashubian
mountain	kaÎns	Latvian
mountain	kalnas	Lithuanian
mountain	gəra	LowerSorbian

mountain	planina	Macedonian
mountain	gəra	OldChurchSlavic
mountain	grabis	OldPrussian
mountain	gura	Polish
mountain	gəra	Russian
mountain	planĭna	SerboCroatian
mountain	gŏra	SerboCroatian
mountain	kopets	Slovak
mountain	vŗx	Slovak
mountain	gð:ra	Slovenian
mountain	həra	Ukrainian
mountain	hora	UpperSorbian
mouth	rət	Belarusian
mouth	usta	Bulgarian
mouth	u:sta	Czech
mouth	gãba	Kashubian
mouth	mute	Latvian
mouth	burna	Lithuanian
mouth	guba	LowerSorbian
mouth	usta	Macedonian
mouth	usta	OldChurchSlavic
mouth	austo	OldPrussian
mouth	usta	Polish
mouth	rət	Russian
mouth	ŭ:sta	SerboCroatian
mouth	uːsta	Slovak
mouth	ŭ:sta	Slovenian
mouth	rət	Ukrainian
mouth	huba	UpperSorbian
name	im ^j a	Belarusian
name	imə	Bulgarian
name	jme:no	Czech

name	miono	Kashubian
name	vā̀rds	Latvian
name	vardas	Lithuanian
name	mı	LowerSorbian
name	imε	Macedonian
name	imẽ	OldChurchSlavic
name	emmens	OldPrussian
name	imjε	Polish
name	im ^j a	Russian
name	îmε	SerboCroatian
name	meno	Slovak
name	imê:	Slovenian
name	imja	Ukrainian
name	mĕɛnɔ	UpperSorbian
narrow	vuzk ^j i	Belarusian
narrow	tesən	Bulgarian
narrow	u:zki:	Czech
narrow	wąsczi	Kashubian
narrow	šàurs	Latvian
narrow	siauras	Lithuanian
narrow	ankštas	Lithuanian
narrow	huski	LowerSorbian
narrow	tesen	Macedonian
narrow	tæsnŏ	OldChurchSlavic
narrow	õ zŭkŭ	OldChurchSlavic
narrow	vəữjsk ^j i	Polish
narrow	uzkij	Russian
narrow	ûzak	SerboCroatian
narrow	u:zki	Slovak
narrow	ŏ:zək	Slovenian
narrow	vuz ⁱ kıj	Ukrainian
narrow	wuski	UpperSorbian

near	bl ^j izka	Belarusian
near	blizku	Bulgarian
near	bli:zkə	Czech
near	blisczi	Kashubian
near	tuvu	Latvian
near	arti	Lithuanian
near	blizko	LowerSorbian
near	blizu	Macedonian
near	blizŏ	OldChurchSlavic
near	bliskə	Polish
near	bl ^j izkə	Russian
near	blĭ:zu	SerboCroatian
near	bli:zkə	Slovak
near	blĭ:zu	Slovenian
near	błız ^j kə	Ukrainian
near	blizkə	UpperSorbian
neck	şija	Belarusian
neck	vrat	Bulgarian
neck	∫ijə	Bulgarian
neck	kŗk	Czech
neck	szëja	Kashubian
neck	kakls	Latvian
neck	kaklas	Lithuanian
neck	şəja	LowerSorbian
neck	vrat	Macedonian
neck	vuja	OldChurchSlavic
neck	winsus	OldPrussian
neck	şəja	Polish
neck	şeja	Russian
neck	vrâ:t	SerboCroatian
neck	kŗk	Slovak
neck	vrâ:t	Slovenian
neck	şıja	Ukrainian

neck	∫ija	UpperSorbian
new	nəvi	Belarusian
new	nəv	Bulgarian
new	novi:	Czech
new	nowi	Kashubian
new	jaûns	Latvian
new	naujas	Lithuanian
new	nowș	LowerSorbian
new	nov	Macedonian
new	nəvŭ	OldChurchSlavic
new	nawans	OldPrussian
new	novș	Polish
new	nəvij	Russian
new	nôv	SerboCroatian
new	novi:	Slovak
new	now	Slovenian
new	novij	Ukrainian
new	ņoș	UpperSorbian
night	nətş	Belarusian
night	no∫t	Bulgarian
night	nots	Czech
night	noc	Kashubian
night	nakts	Latvian
night	naktis	Lithuanian
night	nots	LowerSorbian
night	noc	Macedonian
night	nəſtĭ	OldChurchSlavic
night	nacktien	OldPrussian
night	nəts	Polish
night	nət∫	Russian
night	nô:te	SerboCroatian
night	nots	Slovak

night	nôːt∫	Slovenian
night	n ^j itş	Ukrainian
night	nots	UpperSorbian
nose	nəs	Belarusian
nose	nəs	Bulgarian
nose	nəs	Czech
nose	nos	Kashubian
nose	dęguns	Latvian
nose	nosis	Lithuanian
nose	nəs	LowerSorbian
nose	nos	Macedonian
nose	nəsŭ	OldChurchSlavic
nose	nozy	OldPrussian
nose	nəs	Polish
nose	nəs	Russian
nose	nô:s	SerboCroatian
nose	nəs	Slovak
nose	nô:s	Slovenian
nose	n ^j is	Ukrainian
nose	nus	UpperSorbian
not	$n^j\epsilon$	Belarusian
not	nε	Bulgarian
not	nε	Czech
not	nié	Kashubian
not	ne	Latvian
not	ne	Lithuanian
not	ຸກະ	LowerSorbian
not	ne	Macedonian
not	nε	OldChurchSlavic
not	ni	OldPrussian
not	ຸກະ	Polish
not	n ^j e	Russian

	1	I
not	nε	SerboCroatian
not	nie	Slovak
not	nε	Slovenian
not	nε	Ukrainian
not	nĕε	UpperSorbian
old	stari	Belarusian
old	star	Bulgarian
old	stari:	Czech
old	stôri	Kashubian
old	vęcs	Latvian
old	senas	Lithuanian
old	starș	LowerSorbian
old	star	Macedonian
old	starŭ	OldChurchSlavic
old	urs	OldPrussian
old	starș	Polish
old	starij	Russian
old	stâr	SerboCroatian
old	stari:	Slovak
old	star	Slovenian
old	starıj	Ukrainian
old	starə	UpperSorbian
one	adz ⁱ in	Belarusian
one	nibe	Bulgarian
one	jeden	Czech
one	jeden	Kashubian
one	viêns	Latvian
one	vienas	Lithuanian
one	jaden	LowerSorbian
one	edɛn	Macedonian
one	jɛdinŏ	OldChurchSlavic
one	ains	OldPrussian

one	jeden	Polish
one	ad ^j in	Russian
one	jědan	SerboCroatian
one	jejen	Slovak
one	εn	Slovenian
one	ədın	Ukrainian
one	jɛdə̯n	UpperSorbian
other	druş ^j i	Belarusian
other	inși	Belarusian
other	drug	Bulgarian
other	jīni:	Czech
other	druhi:	Czech
other	jiny	Kashubian
other	cits	Latvian
other	kitas	Lithuanian
other	anas	Lithuanian
other	drugi	LowerSorbian
other	drug	Macedonian
other	drugŏ	OldChurchSlavic
other	inŏ	OldChurchSlavic
other	kittans	OldPrussian
other	innș	Polish
other	drug ^j i	Polish
other	drugoj	Russian
other	drûgi:	SerboCroatian
other	ini:	Slovak
other	druĥi:	Slovak
other	drû:g	Slovenian
other	ınşıj	Ukrainian
other	druhıj	Ukrainian
other	drui	UpperSorbian
nerson	tsałavisk	Belarusian
person	-tenne - ch	

person	t∫lovjεk	Czech
person	cìlvęks	Latvian
person	persona	Latvian
person	l ^j uz	LowerSorbian
person	t∫ovεk	Macedonian
person	f ləvækŭ	OldChurchSlavic
person	smunents	OldPrussian
person	tşwəvjɛk	Polish
person	t∫ilav ^j ɛk	Russian
person	t∫ôvjɛk	SerboCroatian
person	t∫lovεk	Slovak
person	t∫lô:vεk	Slovenian
person	l ^j udīna	Ukrainian
person	t∫wojεk	UpperSorbian
play	grac	Kashubian
play	žaisti	Lithuanian
play	γul ^j ats ^j	Belarusian
play	igrajə	Bulgarian
play	hra:t	Czech
play	spēlējas	Latvian
play	rõtaļãjas	Latvian
play	grae	LowerSorbian
play	igra	Macedonian
play	igrati	OldChurchSlavic
play	bavitece	Polish
play	grate	Polish
play	igrat ^j	Russian
play	îgrati	SerboCroatian
play	hrac	Slovak
play	igră:ti	Slovenian
play	hratı	Ukrainian
play	Rat∫	UpperSorbian

pulltrauktiLithuanianpulltsiaynutsiBelarusianpulldyrpomBulgarianpullta:fnoutCzechpullvèlkLatvianpullergnueLowerSorbianpullvletfeMacedonianpullvletfeOldChurchSlavicpulltënsītweīOldPrussianpullteoŋgnoptePolishpullteongnoptePolishpullvâ:teiSerboCroatianpullvâftiUkrainianpullvâ:teiSlovakpulltiánştfUpperSorbianpulltjánştfUpperSorbianpulltjánştfUpperSorbianpushpchacKashubianpushptatsiBelarusianpushbutomBulgarianpushtuntiCzechpushtwotsşeLowerSorbianpushtrvatiOldChurchSlavicpushtrvatiOldChurchSlavicpushtwotsşeLowerSorbianpushtwotsşeLowerSorbianpushtwotsşeLowerSorbianpushtrvatiOldChurchSlavicpushtwotsşeLowerSorbianpushtwotsşeLowerSorbianpushtwotsşeLowerSorbianpushtrvatiOldChurchSlavicpushtrvatiOldChurchSlavicpushtrvatiPolishpushtrvatiPolishpushtrvatiP	pull	cygnąc	Kashubian
pulltsiaynutsiBelarusianpulldxrpomBulgarianpullta:finoutCzechpullv\lekLatvianpullergnueLowerSorbianpullvletfeMacedonianpullvleeftiOldChurchSlavicpulltensītweīOldPrussianpullteongnoptePolishpullteongnoptePolishpullvulteiRussianpullvietfiSlovakpullvietifiSlovakpullvietifiSlovakpullvleftiUpperSorbianpulltifanştfUpperSorbianpulltfanştfUpperSorbianpushpchacKashubianpushptatsiBelarusianpushbutomBulgarianpushtlatfitCzechpushbutomBulgarianpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaPolishpushfteisnoptePolishpushfteisnoptePolishpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaPolishpushturkaPolish<	pull	traukti	Lithuanian
pulldxrpomBulgarianpullta:fnoutCzechpullvèlkLatvianpullsignueLowerSorbianpullvletfɛMacedonianpullvlæftiOldChurchSlavicpulltēnsītweīOldPrussianpulltēoŋgnoptePolishpullteoŋgnoptePolishpullvû:teiSerboCroatianpullvû:teiSlovakpullvlăftıUkrainianpulltiantiSlovakpullvî:teiSlovenianpulltjânqtʃUpperSorbianpulltjânqtʃUpperSorbianpushpchacKashubianpushpxatsiBelarusianpushbutəmBulgarianpushtlatʃitCzechpushbutəmBulgarianpushbidaLatvianpushtwotsəɛLowerSorbianpushtwotsəɛLowerSorbianpushtrivatiOldChurchSlavicpushturkaMacedonianpushturkaMacedonianpushturkaPolishpushturkaPolishpushtiatiıCidPrussianpushtictkatiRussian	pull	ts ^j aynuts ^j	Belarusian
pullta:finoutCzechpullv\\u00e9kLatvianpulleignueLowerSorbianpullvletf\u00e9Macedonianpullvletf\u00e9OldChurchSlavicpullt\u00e9nsitkeriOldPrussianpullt\u00e9nsitkeriPolishpullt\u00e9nsitkeriPolishpullt\u00e9nsitkeriSerboCroatianpullv\u00e9:tfiSlovenianpullcafacSlovakpullv\u00e9:tfiSlovenianpullv\u00e9:tfiSlovenianpullt\u00e9antfUpperSorbianpulltfan\u00e9tfUpperSorbianpushpchacKashubianpushpxatsiBelarusianpushbutəmBulgarianpushbutəmBulgarianpushtlatfitCzechpushbidaLatvianpushbidaLatvianpushtwots\u00e9cLowerSorbianpushtrvatiOldChurchSlavicpushtrvatiOldChurchSlavicpushk\u00e9cPolishpushtrvatiOldChurchSlavicpushtrvatiOldPrussianpushtotkatiPolishpushtotkatiPolish	pull	dxrpəm	Bulgarian
pullv\\end{v}lkLatvianpullergnueLowerSorbianpullvletf\(\varepsilon\)Macedonianpullvl\(\varepsilon\)OldChurchSlavicpullt\(\varepsilon\)OldPrussianpullt\(\varepsilon\)Polishpullt\(\varepsilon\)Polishpullt\(\varepsilon\)Russianpullt\(\varepsilon\)SerboCroatianpullv\(\varepsilon\)Slovakpullv\(\varepsilon\)Slovakpullvl\(\varepsilon\)Slovakpullvl\(\varepsilon\)Slovakpullt\(\varepsilon\)Slovakpullt\(\varepsilon\)Slovakpullt\(\varepsilon\)Slovakpullt\(\varepsilon\)Slovakpullt\(\varepsilon\)Slovakpullt\(\varepsilon\)Slovakpullt\(\varepsilon\)UpperSorbianpushstumtiLithuanianpushstumtiLithuanianpushpxatsiBelarusianpushbutəmBulgarianpushtlat\(\varepsilon\)LatvianpushturkaMacedonianpushturkaMacedonianpushturkaMacedonianpushturkaPolishpushtroPolishpushtolkatiRussian	pull	ta:hnout	Czech
pull\$\vec{e}\$ ignueLowerSorbianpull\$\vec{vlet}\$\$\vec{le}\$Macedonianpull\$\vec{vlet}\$\$\vec{le}\$OldChurchSlavicpull\$\vec{vlet}\$\$\vec{le}\$OldPrussianpull\$\vec{vlet}\$\$\vec{le}\$Polishpull\$\vec{vanut}\$Russianpull\$\vec{vanut}\$SerboCroatianpull\$\vec{vanut}\$Slovakpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpull\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenianpush\$\vec{vanut}\$Slovenian	pull	vèlk	Latvian
pullvletfeMacedonianpullvlæftiOldChurchSlavicpulltēnsītweīOldPrussianpullteoŋgnojtePolishpullt/anutiRussianpullt/anutiRussianpullvû:teiSerboCroatianpullcafacSlovakpullvlě:tfiSlovenianpullt/ánatUkrainianpullt/fanatfUkrainianpullt/fanatfUpperSorbianpushpchacKashubianpushpxatsiBelarusianpushbutomBulgarianpushtlatfitCzechpushstumjLatvianpushbidaLatvianpushtwotsgeLowerSorbianpushtrivatiOldChurchSlavicpushtivatiOldChurchSlavicpushtivatiPolishpushtivatiRussian	pull	eignue	LowerSorbian
pullvlæftiOldChurchSlavicpulltēnsītweīOldPrussianpullteoŋgnoŋtePolishpulltianutiRussianpullvû:teiSerboCroatianpullcafiacSlovakpullvlě:tſīSlovenianpulltiánttUkrainianpulltífarọtſUpperSorbianpushpchacKashubianpushstumtiLithuanianpushpxatsiBelarusianpushbutəmBulgarianpushtlatſītCzechpushstumjLatvianpushbīdaLatvianpushtwotsọeLowerSorbianpushturkaMacedonianpushturkaPolishpushfteisnoptePolishpushfteisnoptePolishpushfteisnoptePolishpushtotkatiRussian	pull	vlet∫ε	Macedonian
pulltēnsītweīOldPrussianpullteoŋgnojitePolishpulltianutiRussianpullvû:teiSerboCroatianpullcaĥacSlovakpullcaĥacSlovakpullvlě:tſiSlovenianpulltiántiUkrainianpulltjánọtſUpperSorbianpushpchacKashubianpushstumtiLithuanianpushpxatsiBelarusianpushbutəmBulgarianpushtlatʃitCzechpushstumjLatvianpushbīdaLatvianpushturkaMacedonianpushturkaOldChurchSlavicpushkūmpīntOldPrussianpushfteisnojtePolishpushfteisnojtePolishpushfteisnojtePolishpushtołkatiRussian	pull	vlæ∫ti	OldChurchSlavic
pullteəŋgnəntePolishpullt/anut/Russianpullvû:teiSerboCroatianpullcañacSlovakpullvlč:tſiSlovenianpullt/ántıUkrainianpullt/fanətſUpperSorbianpushpchacKashubianpushstumtiLithuanianpushpxats ^j BelarusianpushbutəmBulgarianpushtlatʃitCzechpushstumjLatvianpushbīdaLatvianpushturkaMacedonianpushturkaMacedonianpushturkaOldChurchSlavicpushkūmpīntOldPrussianpushteisnoptePolishpushttołkatiRussian	pull	tēnsītweī	OldPrussian
pulltianutiRussianpullvû:teiSerboCroatianpullcafiacSlovakpullvlě:tſiSlovenianpullt/afitUkrainianpullt/fanətſUpperSorbianpushpchacKashubianpushstumtiLithuanianpushpxatsjBelarusianpushbutəmBulgarianpushtlatʃitCzechpushstumjLatvianpushbitəmBulgarianpushtwətsəcLowerSorbianpushtwətsəcLowerSorbianpushturkaMacedonianpushturkaOldChurchSlavicpushfteisnəntePolishpushfteisnəntePolishpushtətkatiRussian	pull	tcongnontc	Polish
pullvû:teiSerboCroatianpullcañacSlovakpullvlě:tſiSlovenianpullt/afitiUkrainianpullt/anṣtſUpperSorbianpushpchacKashubianpushstumtiLithuanianpushnats'isnuts ^j Belarusianpushpxats ^j BelarusianpushtlatſitCzechpushtlatſitCzechpushstumjLatvianpushbĭdaLatvianpushtwotsşeLowerSorbianpushturkaMacedonianpushtivatiOldChurchSlavicpushfteisnontePolishpushfteisnontePolishpushtxotaRussian	pull	t ^j anut ^j	Russian
pullcafiacSlovakpullvlě:tſiSlovenianpullt/aftıUkrainianpullt/fanətſUpperSorbianpushpchacKashubianpushstumtiLithuanianpushnatsʲisnutsʲBelarusianpushpxatsʲBelarusianpushbutəmBulgarianpushtlatʃitCzechpushstumjLatvianpushbīdaLatvianpushtwətsəcLowerSorbianpushtrivatiOldChurchSlavicpushrivatiOldPrussianpushfteisnəntePolishpushfteisnəntePolishpushtxətePolish	pull	vû:tei	SerboCroatian
pullvlě:tfiSlovenianpullt/afitiUkrainianpullt/anətfUpperSorbianpushpchacKashubianpushstumtiLithuanianpushnats'isnuts ^j Belarusianpushpxats ^j BelarusianpushbutəmBulgarianpushtlatfitCzechpushstumjLatvianpushbidaLatvianpushtwətsəeLowerSorbianpushturkaMacedonianpushturkaOldChurchSlavicpushfteisnəntePolishpushtsümpīntOldPrussianpushtətkatiRussian	pull	caĥac	Slovak
pullt/afitiUkrainianpullt/anət/UpperSorbianpushpchacKashubianpushstumtiLithuanianpushnats ⁱ isnuts ⁱ Belarusianpushpxats ^j BelarusianpushbutəmBulgarianpushtlat/îtCzechpushstumjLatvianpushbīdaLatvianpushtwətsəcLowerSorbianpushturkaMacedonianpushturkaOldChurchSlavicpushfteisnəntePolishpushtzəlkatiRussian	pull	vlě:tʃi	Slovenian
pulltʃanṣtʃUpperSorbianpushpchacKashubianpushstumtiLithuanianpushnats ⁱ isnuts ^j Belarusianpushpxats ^j BelarusianpushbutəmBulgarianpushtlatʃitCzechpushstumjLatvianpushbĭdaLatvianpushtwotsşeLowerSorbianpushturkaMacedonianpushrivatiOldChurchSlavicpushfteisnontePolishpushttətkatiRussian	pull	t ^j aĥtı	Ukrainian
pushpchacKashubianpushstumtiLithuanianpushnats ^j isnuts ^j Belarusianpushpxats ^j BelarusianpushbutəmBulgarianpushtlatfitCzechpushstumjLatvianpushbīdaLatvianpushtwətsəcLowerSorbianpushtrwatiOldChurchSlavicpushrivatiOldPrussianpushfteisnəntePolishpushtətkatiRussian	pull	t∫anọt∫	UpperSorbian
pushstumtiLithuanianpushnatsiisnutsiBelarusianpushpxatsiBelarusianpushbutəmBulgarianpushtlatʃitCzechpushtlatʃitCzechpushstumjLatvianpushbīdaLatvianpushtwətsəeLowerSorbianpushturkaMacedonianpushtivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnəptePolishpushtətkatiRussian	push	pchac	Kashubian
pushnats ^j isnuts ^j Belarusianpushpxats ^j BelarusianpushbutəmBulgarianpushtlatʃitCzechpushstumjLatvianpushbĭdaLatvianpushbĭdaLatvianpushtwotsşeLowerSorbianpushturkaMacedonianpushrivatiOldChurchSlavicpushfteisnoptePolishpushttołkat ^j Russian	push	stumti	Lithuanian
pushpxatsiBelarusianpushbutəmBulgarianpushtlatfitCzechpushstumjLatvianpushbīdaLatvianpushtwətsəcLowerSorbianpushturkaMacedonianpushtivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnəptePolishpushtəłkatiRussian	push	nats ^j isnuts ^j	Belarusian
pushbutəmBulgarianpushtlatfitCzechpushstumjLatvianpushbīdaLatvianpushtwotsəeLowerSorbianpushturkaMacedonianpushrivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnoptePolishpushtɔłkatiRussian	push	pxats ^j	Belarusian
pushtlatfitCzechpushstumjLatvianpushbĩdaLatvianpushtwotsọcLowerSorbianpushturkaMacedonianpushturkaOldChurchSlavicpushkūmpīntOldPrussianpushfteisnontePolishpushturkaRussian	push	butəm	Bulgarian
pushstumjLatvianpushbĩdaLatvianpushbĩdaLatvianpushtwətsəLowerSorbianpushturkaMacedonianpushrivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnontePolishpushpxatePolishpushtəłkatiRussian	push	tlat∫ıt	Czech
pushbīdaLatvianpushtwotsĢeLowerSorbianpushturkaMacedonianpushrivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnoptePolishpushpxatePolishpushtɔłkatiRussian	push	stumj	Latvian
pushtwotsoeLowerSorbianpushturkaMacedonianpushrivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnontePolishpushpxatePolishpushtołkatiRussian	push	bĩda	Latvian
pushturkaMacedonianpushrivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnontePolishpushpxatePolishpushtołkatiRussian	push	twotsęc	LowerSorbian
pushrivatiOldChurchSlavicpushkūmpīntOldPrussianpushfteisnoptePolishpushpxatePolishpushtołkatiRussian	push	turka	Macedonian
pushkūmpīntOldPrussianpushfteisnoptePolishpushpxatePolishpushtołkatiRussian	push	rivati	OldChurchSlavic
pushfteisnoptePolishpushpxatePolishpushtɔłkat ^j Russian	push	kūmpīnt	OldPrussian
pushpxatcPolishpushtɔłkat ^j Russian	push	fteisnopte	Polish
push təłkat ^j Russian	push	pxate	Polish
	push	təłkat ^j	Russian

push	gŭ∵rati	SerboCroatian
push	strkac	Slovak
push	surac	Slovak
push	naučiti	Slovak
pusn	рәхал	
pusn	natisnuti	
pusn	pxati	Ukrainian
push	twot∫it∫	UpperSorbian
rain	dəzdz	Belarusian
rain	drzd	Bulgarian
rain	dɛ:∫c	Czech
rain	deszcz	Kashubian
rain	liêtus	Latvian
rain	lietus	Lithuanian
rain	deștc	LowerSorbian
rain	dozd	Macedonian
rain	dŏʒdĭ	OldChurchSlavic
rain	sūjē	OldPrussian
rain	aglo	OldPrussian
rain	deștș	Polish
rain	dəzd ^j	Russian
rain	kî∫a	SerboCroatian
rain	da:31	Slovak
rain	dəz	Slovenian
rain	dəştş	Ukrainian
rain	deſtſik	UpperSorbian
red	tşirvəni	Belarusian
red	t∫ərvɛn	Bulgarian
red	t∫εrvεni:	Czech
red	czerwòny	Kashubian
red	saŕkans	Latvian
red	raudonas	Lithuanian
red	tsɛr ⁱ jɛnəฺ	LowerSorbian

red	tsərven	Macedonian
red	tſŗ ^j vʎɛnŏ	OldChurchSlavic
red	wormyan	OldPrussian
red	urminan	OldPrussian
red	tşervənə	Polish
red	krasnij	Russian
red	tsřven	SerboCroatian
red	t∫εrveni:	Slovak
red	ərdεt∫	Slovenian
red	tşervənij	Ukrainian
red	t∫εrwĕεnọ	UpperSorbian
right	prav ^j il ^j ni	Belarusian
right	pravilən	Bulgarian
right	spra:vni:	Czech
right	prawi	Kashubian
right	pareĩzs	Latvian
right	dešinė	Lithuanian
right	pşawə	LowerSorbian
right	pravilen	Macedonian
right	pravŏ	OldChurchSlavic
right	tickars	OldPrussian
right	popravne	Polish
right	prav ^j il ^j nij	Russian
right	îspra:van	SerboCroatian
right	tôt∫an	SerboCroatian
right	spra:vni	Slovak
right	praw	Slovenian
right	pravıl ^j nıj	Ukrainian
right	ркажэ	UpperSorbian
rightside	pravi	Belarusian
rightside	dəsen	Bulgarian

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road	droga	Kashubian
road	ceļš	Latvian
road	kelias	Lithuanian
road	droga	LowerSorbian
road	pat	Macedonian
road	põtĭ	OldChurchSlavic
road	pintis	OldPrussian
road	drəga	Polish
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road	pû:t	SerboCroatian
road	tsɛsta	Slovak
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road	put∫	UpperSorbian
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root	kərən	Bulgarian
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root	sakne	Latvian
root	šaknis	Lithuanian
root	kəren	LowerSorbian
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rotten	trûo	SerboCroatian
rotten	zhpiti:	Slovak
rotten	gnî:w	Slovenian
rotten	ĥnīłīj	Ukrainian
rotten	zn ^j iwə	UpperSorbian
round	krugłi	Belarusian
round	krygəł	Bulgarian
round	əkrəufili:	Czech
round	òkrãgłi	Kashubian
round	apaļš	Latvian
round	apskritas	Lithuanian
round	apvalus	Lithuanian
round	kul ^j owat <u>ş</u>	LowerSorbian
round	tərkalezen	Macedonian
round	əkrõglŭ	OldChurchSlavic
round	əkrəŋgwə	Polish
round	krugłij	Russian
round	okrŭ∶gao	SerboCroatian
round	əkru:hli	Slovak
round	okrŏ∶gəw	Slovenian
round	kruhłıj	Ukrainian
round	kuləjtə	UpperSorbian
rub	trzéc	Kashubian
rub	trinti	Lithuanian
rub	ts ^j ɛrts ^j i	Belarusian
rub	trijə	Bulgarian
rub	tři:t	Czech
rub	beîž	Latvian
rub	tr ^j ic	LowerSorbian
rub	trie	Macedonian
rub	tŗ ^j ti	OldChurchSlavic
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mb	drostwo	OldDrussion
rub	uraziwei	OldPlussiali
rub	tşetc	Polish
rub	t ^j er ^j et ^j	Russian
rub	tř:Kati	SerboCroatian
rub	triec	Slovak
rub	trě:ti	Slovenian
rub	tertı	Ukrainian
rub	trit∫	UpperSorbian
salt	səlj	Belarusian
salt	səł	Bulgarian
salt	su:1	Czech
salt	sól	Kashubian
salt	sāls	Latvian
salt	druska	Lithuanian
salt	səl ^j	LowerSorbian
salt	sol	Macedonian
salt	səlĭ	OldChurchSlavic
salt	sali	OldPrussian
salt	sul	Polish
salt	səlj	Russian
salt	sô:l	SerboCroatian
salt	səlj	Slovak
salt	sô:w	Slovenian
salt	sil ^j	Ukrainian
salt	sol	UpperSorbian
sand	p ⁱ asək	Belarusian
sand	p ^j asək	Bulgarian
sand	pi:sɛk	Czech
sand	piôsk	Kashubian
sand	smìlts	Latvian
sand	smėlis	Lithuanian
sand	pısk	LowerSorbian

sand	pesok	Macedonian
sand	pæsŏkŏ	OldChurchSlavic
sand	sixdo	OldPrussian
sand	pjasek	Polish
sand	p ^j isək	Russian
sand	pjĕ∷sak	SerboCroatian
sand	piesok	Slovak
sand	pě:sək	Slovenian
sand	pisək	Ukrainian
sand	pısk	UpperSorbian
say	gôdac	Kashubian
say	sakyti	Lithuanian
say	skazats ^j	Belarusian
say	kazvəm	Bulgarian
say	ŗi:tst	Czech
say	saka	Latvian
say	tèic	Latvian
say	runat	Latvian
say	tarti	Lithuanian
say	gronie	LowerSorbian
say	казғ	Macedonian
say	rɛ∫ti	OldChurchSlavic
say	gerdawi	OldPrussian
say	povjedzete	Polish
say	skazat ^j	Russian
say	kă:zati	SerboCroatian
say	rêtci	SerboCroatian
say	povedac	Slovak
say	rêːt∫i	Slovenian
say	skazatı	Ukrainian
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scratch	kasyti	Lithuanian
scratch	tşuxats ^j	Belarusian
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scratch	kasa	Latvian
scratch	krapštyti	Lithuanian
scratch	drapac	LowerSorbian
scratch	grebe	Macedonian
scratch	t∫esati	OldChurchSlavic
scratch	drapate	Polish
scratch	t∫ɛsat ^j	Russian
scratch	t∫̃€∫ati	SerboCroatian
scratch	∫krabac	Slovak
scratch	pră:skati	Slovenian
scratch	tşuxatı	Ukrainian
scratch	drapat∫	UpperSorbian
sea	mora	Belarusian
sea	mure	Bulgarian
sea	more	Czech
sea	mòrze	Kashubian
sea	jũra	Latvian
sea	jūra	Lithuanian
sea	marios	Lithuanian
sea	mər ^j ə	LowerSorbian
sea	more	Macedonian
sea	mər ^j e	OldChurchSlavic
sea	iūrin	OldPrussian
sea	məze	Polish
sea	mər ^j e	Russian
sea	mô:re	SerboCroatian

sea	məre	Slovak
sea	môːrjε	Slovenian
sea	məre	Ukrainian
sea	токјо	UpperSorbian
see	widzec	Kashubian
see	matyti	Lithuanian
see	batşits ^j	Belarusian
see	vizdəm	Bulgarian
see	vıjet	Czech
see	redz	Latvian
see	wizec	LowerSorbian
see	glɛda	Macedonian
see	vidæti	OldChurchSlavic
see	widdai	OldPrussian
see	vidzetc	Polish
see	v ^j id ^j ɛt ^j	Russian
see	vîdjeti	SerboCroatian
see	vijiec	Slovak
see	vĭ:dɛti	Slovenian
see	batşıtı	Ukrainian
see	widʒɛt∫	UpperSorbian
seed	nas ^j en ^j n ^j e	Belarusian
seed	sems	Bulgarian
seed	semeno	Czech
seed	semiã	Kashubian
seed	sę̃kla	Latvian
seed	sėkla	Lithuanian
seed	semĕe	LowerSorbian
seed	seme	Macedonian
seed	sæmẽ	OldChurchSlavic
seed	semen	OldPrussian
seed	nacono	Polish

seed	z ^j erno	Russian
seed	sjême	SerboCroatian
seed	ระทะกว	Slovak
seed	sě:mɛ	Slovenian
seed	nasin ^j n ^j a	Ukrainian
seed	səmjə	UpperSorbian
sew	szëc	Kashubian
sew	siūti	Lithuanian
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sew	∫ijə	Bulgarian
sew	∫i:t	Czech
sew	šuj	Latvian
sew	ခုခဲ့ေ	LowerSorbian
sew	∫ĩε	Macedonian
sew	∫iti	OldChurchSlavic
sew	şətc	Polish
sew	şit ^j	Russian
sew	∫îti	SerboCroatian
sew	∫ic	Slovak
sew	∫ĭ:vati	Slovenian
sew	şıtı	Ukrainian
sew	∫it∫	UpperSorbian
sharp	vəstri	Belarusian
sharp	əstər	Bulgarian
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sharp	ass	Latvian
sharp	aštrus	Lithuanian
sharp	wətşə	LowerSorbian
sharp	ostar	Macedonian
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sharp		UpperSorbian
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short	karətk ⁱ i	Belarusian
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short	krótczi	Kashubian
short	îss	Latvian
short	trumpas	Lithuanian
short	krətki	LowerSorbian
short	kratok	Macedonian
short	kratŏkŏ	OldChurchSlavic
short	īnsan	OldPrussian
short	krutk ^{ij} i	Polish
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short	kra:tki	Slovak
short	kră:tək	Slovenian
short	kərotkıj	Ukrainian
short	krutki	UpperSorbian
sing	spiéwac	Kashubian
sing	dainuoti	Lithuanian
sing	s ⁱ p ^j avats ^j	Belarusian
sing	рєјә	Bulgarian
sing	spi:vat	Czech
sing	dziêd	Latvian
sing	spiwac	LowerSorbian
sing	реғ	Macedonian
sing	pæti	OldChurchSlavic

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sitskadzketsjBelarusiansitseyetBulgariansitseyetCzechsitsédétiLatviansitsédétiLithuaniansitsejzeeLowerSorbiansitsediMacedoniansitsedatiOldChurchSlavicsitsedatiOldPrussiansitsedzetePolishsitsejzecSlovaksitsejétitiSerboCroatiansitsejétitiSlovaksitsedéritSlovaksitsedéritSlovaksitsedéritSlovaksitsedéritSlovaksitsedéritSlovaksitsedérifSlovaksitsedérifSlovaksitsedérifSlovaksitsedérifSlovaksitsedérifSlovaksitsedérifSlovaksitsedérifSlovaksitskinaSkuraskinskuraBelarusianskinkur3eCzechskinâdaLatvianskinôdaLithuanianskinplènèLithuanian	sit	sėsti	Lithuanian
sitsədirBulgariansitsēgētCzechsitsêçdLatviansitsédètiLithuaniansitsejzeeLowerSorbiansitsediMacedoniansitsædætiOldChurchSlavicsitsædætiOldPrussiansitsedizetePolishsitsjidietiRussiansitsejiecSlovaksitsedě:tiSlovaksitsedžetfVuperSorbiansitsedě:tiSlovaksitsedžetfSlovaksitsedě:tiSlovaksitsedžetfSlovaksitsedjetfUpperSorbiansitsedjetfBelarusianskinkur3eCzechskinskóraKashubianskiniddaLatvianskinjidaLatvian	sit	s ^j adz ^j ets ^j	Belarusian
sitsεμεtCzechsitsędLatviansitsedėtiLithuaniansitsejzeeLowerSorbiansitsediaMacedoniansitsedatiOldChurchSlavicsitsædætiOldPrussiansitecdzetePolishsitsjidietiRussiansitsejiecSlovaksitsedě:tiSlovaksitsedě:tiSloveniansitsedě:tiSloveniansitsedě:tiSloveniansitsedě:tiSloveniansitskinkuraBelarusianskinkuraSelarusianskinskóraKashubianskinádaLatvianskinjelněLithuanianskinjelněLithuanian	sit	ribez	Bulgarian
sitsêdLatviansitsédétiLithuaniansitsejzeeLowerSorbiansitsediMacedoniansitsædætiOldChurchSlavicsitsædætiOldPrussiansiteedzetePolishsitsidjetjRussiansitsejiecSlovaksitsedě:tiSlovaksitsedžetfVuperSorbiansitsedjetfUpperSorbiansitsedjetfSlovansitsedjetfCzechskinku:3eCzechskinádaLatvianskinódaLithuanian	sit	sejet	Czech
sitsėdėtiLithuaniansitsejzeeLowerSorbiansitsediMacedoniansitsædætiOldChurchSlavicsitsyndensOldPrussiansitcedzetePolishsitsjidjetjRussiansitsejiecSlovaksitsedě:tiSlovaksitsedjetfUkrainiansitsedjetfSloveniansitsedjetfSlovaksitsedjetfSlovaksitsedjetfSloveniansitsedjetfSloveniansitsedjetfSloveniansitskinaSedjetfskinskuraBelarusianskinku:3eCzechskinádaLatvianskinódaLithuanianskinjelėvėLithuanian	sit	sệd	Latvian
sitsejzeeLowerSorbiansitsediMacedoniansitsædætiOldChurchSlavicsitsædætiOldPrussiansiteedzetePolishsitsjöletjRussiansitsejiecSlovaksitsedě:tiSlovaksitsedžetfUlrainiansitsedžetíSlovaksitsedě:tiSloveniansitsedžetfSlovaksitsedě:tiSloveniansitsedžetfSlovaksitsedžetfSlovaksitsedžetfSlovaksitskuraBelarusianskinku:3eCzechskinádaLatvianskinódaLithuanian	sit	sėdėti	Lithuanian
sitsediMacedoniansitsædætiOldChurchSlavicsitsyndensOldPrussiansitcedzetcPolishsits ^j id ^j et ^j RussiansitsjjčditiSerboCroatiansitsejiecSlovaksitseděčtiSloveniansitseděčtiSloveniansitseděčtiSloveniansitsedžetýSloveniansitsedžetýSloveniansitsedžetýSloveniansitsedžetýSloveniansitskinSkiraskinku:3eCzechskinádaLatvianskinjelněLithuanian	sit	sejzec	LowerSorbian
sitsædætiOldChurchSlavicsitsyndensOldPrussiansitcædzetePolishsits ^j id ^j et ^j Russiansitsj ^j čditiSerboCroatiansitsejiecSlovaksitsedě:tiSloveniansitsedjetUkrainiansitsedjetUpperSorbiansitskuraBelarusianskinku:3eCzechskinádaLatvianskinjehěLithuanian	sit	sedi	Macedonian
sitsyndensOldPrussiansitcedzetePolishsits ^j id ^j et ^j RussiansitsjšditiSerboCroatiansitsejiecSlovaksitsedě:tiSloveniansitsedě:tiUkrainiansitsed3et∫UpperSorbianskinku:3eBelarusianskinku:3eCzechskinádaLatvianskinjódaLatvian	sit	sædæti	OldChurchSlavic
sitcɛdzetcPolishsitsʲidʲɛtʲRussiansitsjšditiSerboCroatiansitsɛjiɛcSlovaksitsɛděːtiSloveniansitsɛdźɛtíUkrainiansitsɛdʒɛtʃUpperSorbianskinkuːʒɛEelarusianskinkuːʒɛCzechskinâdaLatvianskinjidaLatvian	sit	syndens	OldPrussian
sits ^j id ^j et ^j RussiansitsjčditiSerboCroatiansitsejiecSlovaksitsedě:tiSloveniansitsedě:tiUkrainiansitsed3etſUpperSorbianskinkv33Belarusianskinku:3εCzechskinâdaLatvianskinodaLithuanian	sit	çedzetç	Polish
sitsjěditiSerboCroatiansitsejiecSlovaksitsedě:tiSloveniansitsrdjitiUkrainiansitsed3etfUpperSorbianskinskuraBelarusianskinkv39Bulgarianskinku'3eCzechskinádaLatvianskinódaLithuanian	sit	s ^j id ^j ɛt ^j	Russian
sitsεjiεcSlovaksitsedě:tiSloveniansitsrdjitiUkrainiansitsed3εtfUpperSorbianskinskuraBelarusianskink>32Bulgarianskinku:3εCzechskinâdaLatvianskinodaLithuanian	sit	sjěditi	SerboCroatian
sitsεdě:tiSloveniansitsɪdʲitıUkrainiansitsedʒɛtʃUpperSorbianskinskuraBelarusianskinkɔʒəBulgarianskinkuːʒɛCzechskinâdaLatvianskinodaLithuanianskinplènėLithuanian	sit	sejiec	Slovak
sitsid ^j itiUkrainiansitsedʒɛt∫UpperSorbianskinskuraBelarusianskinkɔʒəBulgarianskinku:ʒɛCzechskinskóraKashubianskinôdaLatvianskinplènėLithuanian	sit	sedě:ti	Slovenian
sit sed3εt∫ UpperSorbian skin skura Belarusian skin kɔ3ɔ Bulgarian skin ku:3ɛ Czech skin âda Kashubian skin oda Latvian skin plènè Lithuanian	sit	sıd ^j itı	Ukrainian
skinskuraBelarusianskinkoʒəBulgarianskinkuːʒɛCzechskinskóraKashubianskinôdaLatvianskinplènėLithuanian	sit	sedʒɛt∫	UpperSorbian
skinkɔʒəBulgarianskinkuːʒɛCzechskinskóraKashubianskinâdaLatvianskinodaLithuanianskinplènėLithuanian	skin	skura	Belarusian
skinku:3εCzechskinskóraKashubianskinâdaLatvianskinodaLithuanianskinplėnėLithuanian	skin	kəzə	Bulgarian
skinskóraKashubianskinâdaLatvianskinodaLithuanianskinplènèLithuanian	skin	ku:3ɛ	Czech
skinâdaLatvianskinodaLithuanianskinplėnėLithuanian	skin	skóra	Kashubian
skinodaLithuanianskinplėnėLithuanian	skin	âda	Latvian
skin plėnė Lithuanian	skin	oda	Lithuanian
	skin	plėnė	Lithuanian

	1	I
skin	kəza	LowerSorbian
skin	koza	Macedonian
skin	ko3a	OldChurchSlavic
skin	keuto	OldPrussian
skin	skura	Polish
skin	kəza	Russian
skin	kôʒa	SerboCroatian
skin	кэза	Slovak
skin	kŏ:3a	Slovenian
skin	şkira	Ukrainian
skin	kəza	UpperSorbian
sky	n ^j ɛba	Belarusian
sky	nəbe	Bulgarian
sky	oblofia	Czech
sky	nebe	Czech
sky	niebò	Kashubian
sky	debess	Latvian
sky	dangus	Lithuanian
sky	nejbjo	LowerSorbian
sky	nebo	Macedonian
sky	nebo	OldChurchSlavic
sky	dangan	OldPrussian
sky	nebo	Polish
sky	n ^j ɛbɔ	Russian
sky	nêbə	SerboCroatian
sky	əbləfia	Slovak
sky	nebo	Slovak
sky	nebô:	Slovenian
sky	nebo	Ukrainian
	1	
sky	nebjo	UpperSorbian
sky	nebjo spac	UpperSorbian Kashubian

sleep	spats ^j	Belarusian
sleep	sp ⁱ r	Bulgarian
sleep	spa:t	Czech
sleep	mieguot	Latvian
sleep	guļ	Latvian
sleep	spac	LowerSorbian
sleep	spie	Macedonian
sleep	sŭpati	OldChurchSlavic
sleep	meicte	OldPrussian
sleep	spate	Polish
sleep	spat ^j	Russian
sleep	spă:vati	SerboCroatian
sleep	spac	Slovak
sleep	spă:ti	Slovenian
sleep	spatı	Ukrainian
sleep	spat∫	UpperSorbian
small	mal ^j en ^j k ^j i	Belarusian
small	małək	Bulgarian
small	mali:	Czech
small	môłi	Kashubian
small	mazs	Latvian
small	mažas	Lithuanian
small	mawə	LowerSorbian
small	mal	Macedonian
small	malŏ	OldChurchSlavic
small	likuts	OldPrussian
small	mawş	Polish
small	mal ^j en ^j k ^j ij	Russian
small	mălen	SerboCroatian
small	mali:	Slovak
small	mâːjhən	Slovenian
small	małıj	Ukrainian

small	mawki	UpperSorbian
smell	cknąc	Kashubian
smell	uostyti	Lithuanian
smell	tşuts ^j	Belarusian
smell	usɛ∫təm	Bulgarian
smell	tsi:cit	Czech
smell	smird	Latvian
smell	ôž	Latvian
smell	tsuc	LowerSorbian
smell	t∫ufstvuva	Macedonian
smell	t∫yti	OldChurchSlavic
smell	smīrdētweī	OldPrussian
smell	tşute	Polish
smell	t∫ustvovat ^j	Russian
smell	ŏsjɛtɛati	SerboCroatian
smell	tsi:cic	Slovak
smell	t∫utĭ:ti	Slovenian
smell	tşutı	Ukrainian
smell	tʃut∫	UpperSorbian
smoke	dim	Belarusian
smoke	pu∫ək	Bulgarian
smoke	di:m	Czech
smoke	kouř	Czech
smoke	dim	Kashubian
smoke	dũmi	Latvian
smoke	dūmai	Lithuanian
smoke	dəm	LowerSorbian
smoke	t∫ad	Macedonian
smoke	dumŭ	OldChurchSlavic
smoke	dumis	OldPrussian
smoke	mẻp	Polish
smoke	dim	Russian

	1	1
smoke	dîm	SerboCroatian
smoke	dim	Slovak
smoke	dim	Slovenian
smoke	dım	Ukrainian
smoke	kur	UpperSorbian
smooth	yładk ^j i	Belarusian
smooth	gładək	Bulgarian
smooth	hladki:	Czech
smooth	głôdczi	Kashubian
smooth	gludęns	Latvian
smooth	lidzens	Latvian
smooth	švelnus	Lithuanian
smooth	nešiurkštus	Lithuanian
smooth	gwadki	LowerSorbian
smooth	mazen	Macedonian
smooth	gladŏkŏ	OldChurchSlavic
smooth	gwatk ^j i	Polish
smooth	gładk ^j ij	Russian
smooth	glâdak	SerboCroatian
smooth	filadki:	Slovak
smooth	glǎ:dək	Slovenian
smooth	hładkıj	Ukrainian
smooth	wadki	UpperSorbian
snake	z ⁱ m ⁱ aja	Belarusian
snake	zmija	Bulgarian
snake	ĥad	Czech
snake	wąż	Kashubian
snake	čũska	Latvian
snake	gyvatė	Lithuanian
snake	žaltys	Lithuanian
snake	huz	LowerSorbian
snake	zmija	Macedonian
snake	zmija	OldChurchSlavic

snake	angis	OldPrussian
	~	D. 11 1
snake	voщz	Polish
snake	zmʲɛja	Russian
snake	zmĭja	SerboCroatian
snake	ĥad	Slovak
snake	kă:t∫a	Slovenian
snake	zmija	Ukrainian
snake	had	UpperSorbian
snow	s ^j n ^j εγ	Belarusian
snow	sn ^j ag	Bulgarian
snow	spi:h	Czech
snow	sniég	Kashubian
snow	snìegs	Latvian
snow	sniegas	Lithuanian
snow	snig	LowerSorbian
snow	sneg	Macedonian
snow	snægŭ	OldChurchSlavic
snow	snaygis	OldPrussian
snow	eneg	Polish
snow	sn ^j ɛg	Russian
snow	snjê:g	SerboCroatian
snow	speĥ	Slovak
snow	snê:g	Slovenian
snow	sniĥ	Ukrainian
snow	sn ^j ı	UpperSorbian
some	n ^j ekal ^j k ^j i	Belarusian
some	trox ^j i	Belarusian
some	n ^j akułku	Bulgarian
some	nekolik	Czech
some	czile	Kashubian
some	daži	Latvian
some	drusku	Latvian
some	kads	Latvian
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some	keli	Lithuanian
some	keletas	Lithuanian
some	ŋɛkətarə	LowerSorbian
some	nekəlku	Macedonian
some	nækəlikŏ	OldChurchSlavic
some	aīnunts	OldPrussian
some	k ^j ilka	Polish
some	trəxe	Polish
some	n ^j eskol ^j ko	Russian
some	nêkəlikə	SerboCroatian
some	niekol ^j ko	Slovak
some	nɛkŏːlikə	Slovenian
some	troxi	Ukrainian
some	kil ^j ka	Ukrainian
some	n ^j ıkətrə	UpperSorbian
spit	plëwac	Kashubian
spit	spjauti	Lithuanian
spit	pljavatsj	Belarusian
spit	pl ^j ujə	Bulgarian
spit	plīvat	Czech
spit	spļaũj	Latvian
spit	pl ^j uwa¢	LowerSorbian
spit	pluka	Macedonian
spit	рЛĭvati	OldChurchSlavic
spit	wemtweī	OldPrussian
spit	plute	Polish
spit	pljevatj	Russian
spit	рんûvati	SerboCroatian
spit	pl ^j uc	Slovak
spit	pljŭ:vati	Slovenian
spit	pl ^j uvatı	Ukrainian
spit	pluwat∫	UpperSorbian

split	rozdzelac	Kashubian
split	skelti	Lithuanian
split	s ^j atşi	Belarusian
split	dz ^j al ^j its ^j	Belarusian
split	dəl ^j x	Bulgarian
split	Jelit	Czech
split	∫ci:pat	Czech
split	skaÎda	Latvian
split	kwoje	LowerSorbian
split	zīl ⁱ ie	LowerSorbian
split	razdeli	Macedonian
split	dæliti	OldChurchSlavic
split	rasts ^j æpiti	OldChurchSlavic
split	spelaūtweī	OldPrussian
split	speltweī	OldPrussian
split	rombate	Polish
split	dzelʲitc	Polish
split	rub ^j it ^j	Russian
split	djeljitj	Russian
split	razdjê:liti	SerboCroatian
split	Jelic	Slovak
split	ru:bac	Slovak
split	dɛlǐ:ti	Slovenian
split	rubatı	Ukrainian
split	d ^j iłıtı	Ukrainian
split	kawat∫	UpperSorbian
split	dʒılit∫	UpperSorbian
squeeze	scëskac	Kashubian
squeeze	spausti	Lithuanian
squeeze	s ^j ts ^j iskats ^j	Belarusian
squeeze	stiskəm	Bulgarian
squeeze	mat∫kat	Czech
squeeze	spiêž	Latvian

squeeze	twətsəs	LowerSorbian
squeeze	stisne	Macedonian
squeeze	tiskati	OldChurchSlavic
squeeze	gneete	Polish
squeeze	teisnopte	Polish
squeeze	szimat ^j	Russian
squeeze	stĭːskati	SerboCroatian
squeeze	tlat∫ic	Slovak
squeeze	stĭːskati	Slovenian
squeeze	tısnutı	Ukrainian
squeeze	davıtı	Ukrainian
squeeze	hn ^j itītī	Ukrainian
squeeze	twot∫it∫	UpperSorbian
stab	pchnąc	Kashubian
stab	durti	Lithuanian
stab	b ^j its ^j	Belarusian
stab	prubəʒdəm	Bulgarian
stab	prumu∫vəm	Bulgarian
stab	pi:xnout	Czech
stab	bədnəut	Czech
stab	IEDURT	Latvian
stab	kawac	LowerSorbian
stab	ubode	Macedonian
stab	bəsti	OldChurchSlavic
stab	boadis	OldPrussian
stab	dzgatc	Polish
stab	zakałivat ^j	Russian
stab	bôsti	SerboCroatian
stab	pixnuc	Slovak
stab	bodnuc	Slovak
stab	bô:sti	Slovenian
stab	kəłəti	Ukrainian

stab	kʰʊt∫	UpperSorbian
stand	wstawac	Kashubian
stand	stoti	Lithuanian
stand	stajats ^j	Belarusian
stand	stujv	Bulgarian
stand	sta:t	Czech
stand	stãv	Latvian
stand	stovėti	Lithuanian
stand	stojac	LowerSorbian
stand	stoi	Macedonian
stand	stojati	OldChurchSlavic
stand	stallā	OldPrussian
stand	state	Polish
stand	stojat ^j	Russian
stand	stăjati	SerboCroatian
stand	sta:c	Slovak
stand	stă:ti	Slovenian
stand	stojatı	Ukrainian
stand	stat∫	UpperSorbian
star	zərka	Belarusian
star	zvəzda	Bulgarian
star	ĥvjɛzda	Czech
star	gwiôzda	Kashubian
star	zvàigzne	Latvian
star	žvaigždė	Lithuanian
star	gwizda	LowerSorbian
star	dzvezda	Macedonian
star	dz ⁱ væzda	OldChurchSlavic
star	lauxnos	OldPrussian
star	gvjazda	Polish
star	zv ^j ɛzda	Russian
star	zvjě:zda	SerboCroatian

star	hviɛzda	Slovak
star	zvě:zda	Slovenian
star	zirka	Ukrainian
star	wizda	UpperSorbian
stick	k ^j ij	Belarusian
stick	prvtſkə	Bulgarian
stick	ĥu:l	Czech
stick	czij	Kashubian
stick	nũja	Latvian
stick	spiēķis	Latvian
stick	lazda	Lithuanian
stick	pagalys	Lithuanian
stick	kij	LowerSorbian
stick	prat	Macedonian
stick	palits ^j a	OldChurchSlavic
stick	laxde	OldPrussian
stick	k ^j ij	Polish
stick	pałka	Russian
stick	prû:t	SerboCroatian
stick	pâlitsa	SerboCroatian
stick	pru:t	Slovak
stick	palitsa	Slovak
stick	pă:litsa	Slovenian
stick	pałıts ^j a	Ukrainian
stick	ki	UpperSorbian
stone	kam ^j en ^j	Belarusian
stone	kamək	Bulgarian
stone	ka:mɛn	Czech
stone	kam	Kashubian
stone	akmens	Latvian
stone	akmuo	Lithuanian
stone	kūlis	Lithuanian
stone	kamen	LowerSorbian

stone	kamen	Macedonian
stone	kamu	OldChurchSlavic
stone	stabis	OldPrussian
stone	kamjen	Polish
stone	kam ^j en ^j	Russian
stone	kâmɛːn	SerboCroatian
stone	kamen	Slovak
stone	kǎ:mən	Slovenian
stone	kamin ^j	Ukrainian
stone	kamen	UpperSorbian
straight	prəsti	Belarusian
straight	prami	Belarusian
straight	praf	Bulgarian
straight	rəvni:	Czech
straight	prosti	Kashubian
straight	tàisns	Latvian
straight	tiesiai	Lithuanian
straight	rownə	LowerSorbian
straight	prav	Macedonian
straight	pravŏ	OldChurchSlavic
straight	ēntikriskāi	OldPrussian
straight	prəstə	Polish
straight	pr ^j amoj	Russian
straight	prâv	SerboCroatian
straight	rəvni:	Slovak
straight	ră:vən	Slovenian
straight	pr ^j amıj	Ukrainian
straight	Runș	UpperSorbian
suck	cëcac	Kashubian
suck	čiulpti	Lithuanian
suck	ssats ^j	Belarusian
suck	smut∫ə	Bulgarian

suck	sa:t	Czech
suck	zîž	Latvian
suck	sukt	Latvian
suck	tsətsac	LowerSorbian
suck	tsitsa	Macedonian
suck	sŏsati	OldChurchSlavic
suck	dastweī	OldPrussian
suck	ssate	Polish
suck	səsat ^j	Russian
suck	sîsati	SerboCroatian
suck	sac	Slovak
suck	səsă:ti	Slovenian
suck	ssatı	Ukrainian
suck	tsətsat∫	UpperSorbian
sun	sontsa	Belarusian
sun	słvntse	Bulgarian
sun	sluntse	Czech
sun	słuńce	Kashubian
sun	saũle	Latvian
sun	saulė	Lithuanian
sun	swəntsə	LowerSorbian
sun	sontse	Macedonian
sun	sļnĭts ⁱ e	OldChurchSlavic
sun	saule	OldPrussian
sun	swoptse	Polish
sun	sontse	Russian
sun	sû:ntsɛ	SerboCroatian
sun	sļŋkə	Slovak
sun	sô:ntsɛ	Slovenian
sun	sontse	Ukrainian
sun	swont∫ko	UpperSorbian
swell	pùchnąc	Kashubian

swell	pursti	Lithuanian
swell	puxnuts ^j	Belarusian
swell	nabuxats ^j	Belarusian
swell	utit∫əm	Bulgarian
swell	pudpuxvəm	Bulgarian
swell	puduvəmse	Bulgarian
swell	nabi:t	Czech
swell	opuxnout	Czech
swell	ote:tst	Czech
swell	tûkst	Latvian
swell	pàmpst	Latvian
swell	pūstis	Lithuanian
swell	həpuknuc	LowerSorbian
swell	nabıgnuc	LowerSorbian
swell	otεt∫ε	Macedonian
swell	dõtisẽ	OldChurchSlavic
swell	gūnziks	OldPrussian
swell	pentspetc	Polish
swell	puxnonte	Polish
swell	puxnut ^j	Russian
swell	ðtetei	SerboCroatian
swell	naboptnac	Slovak
swell	puchnu:c	Slovak
swell	nabrě:kati	Slovenian
swell	puxnuti	Ukrainian
swell	nabuxatı	Ukrainian
swell	bubn ^j it∫	UpperSorbian
swim	płëwac	Kashubian
swim	plaukti	Lithuanian
swim	płavats ^j	Belarusian
swim	płuvəm	Bulgarian
swim	plavat	Czech
swim	peÎd	Latvian
swim	pl ^j ıc	LowerSorbian

swimplivaMacedonianswimplavatiOldChurchSlavicswimpwəvatePolishswimplitiRussianswimplîvatiSerboCroatianswimplâ:vatcSlovakswimplâ:vatiSlovenianswimplavatıUkrainianswimphavatıUpperSorbiantailxvəstBelarusiantailupafkəBulgariantailögónKashubiantailobgenLowerSorbiantailopafkaMacedoniantailopafiOldChurchSlavictailopafiOldChurchSlavictailistagsOldPrussiantailstagsOldPrussiantailxvəstRussiantailxvəstSlovaktailxvəstSlovaktailxvəstSlovaktailxvəstSlovaktailxvəstSlovaktailxvəstSlovaktailxvəstSlovaktailxvəstSlovaktailxvistUyperSorbiantailxvistUyperSorbiantailxvistUkrainiantailxvistBulgariantailxvistUkrainiantailxvistBulgariantailtamtenCzechthattamtenKashubianthattamtenKashubian			
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that	stas	OldPrussian
that	tamten	Polish
that	tət	Russian
that	tâːj	SerboCroatian
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thin	trnək	Bulgarian
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thin	cenczi	Kashubian
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think	mıslet	Czech
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threetrr̃iCzechthreetrzëKashubianthreetrîsLatvianthreetrysLithuanianthreeteiLowerSorbianthreetriMacedonianthreetriMacedonianthreetrijeOldChurchSlavicthreetirtsOldPrussianthreetriiRussianthreetriiRussianthreetriiSerboCroatianthreetriSlovakthreetriSlovakthreetriUpperSorbianthreetsiUpperSorbianthrowmestiLithuanianthrowkiidatsjBelarusian	three	tri	Bulgarian
threetrzëKashubianthreetrîsLatvianthreetrysLithuanianthreeteiLowerSorbianthreetriMacedonianthreetrijεOldChurchSlavicthreetīrtsOldPrussianthreetş9PolishthreetrîRussianthreetrî:SerboCroatianthreetrîSlovakthreetrîUpperSorbianthreetsiUpperSorbianthreetsiLithuanianthrowmestiLithuanian	three	tŗı	Czech
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threetɕiLowerSorbianthreetriMacedonianthreetrĭjɛOldChurchSlavicthreetīrtsOldPrussianthreetşݡPolishthreetriRussianthreetri:SerboCroatianthreetrîSlovakthreetrîSlovakthreetriUlyperSorbianthreetsiUpperSorbianthrowmestiLithuanianthrowkiidatsjBelarusian	three	trys	Lithuanian
threetriMacedonianthreetrĭjεOldChurchSlavicthreetīrtsOldPrussianthreetēş?Polishthreetr ⁱ iRussianthreetrî:SerboCroatianthreetrîSlovakthreetrîSlovakthreetrîUpperSorbianthreetsiUpperSorbianthrowcëskacKashubianthrowkiidatsiBelarusian	three	tei	LowerSorbian
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threetşəPolishthreetriRussianthreetrî:SerboCroatianthreetriSlovakthreetrî:Slovenianthreetrî:SlovenianthreetriUkrainianthreetsiUpperSorbianthrowcëskacKashubianthrowmestiLithuanianthrowkiidatsiBelarusian	three	tīrts	OldPrussian
threetriiRussianthreetrî:SerboCroatianthreetriSlovakthreetrî:SlovenianthreetrīUkrainianthreetsiUpperSorbianthrowcëskacKashubianthrowmestiLithuanianthrowkiidatsiBelarusian	three	ţşə	Polish
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threetrî:SlovenianthreetriUkrainianthreetsiUpperSorbianthrowcëskacKashubianthrowmestiLithuanianthrowkiidatsiBelarusian	three	tri	Slovak
threetriUkrainianthreetsiUpperSorbianthrowcëskacKashubianthrowmestiLithuanianthrowk ⁱ idats ⁱ Belarusian	three	trî:	Slovenian
threetsiUpperSorbianthrowcëskacKashubianthrowmestiLithuanianthrowkiidatsiBelarusian	three	trı	Ukrainian
throwcëskacKashubianthrowmestiLithuanianthrowk ⁱ idats ⁱ Belarusian	three	tsi	UpperSorbian
throwmestiLithuanianthrowk ^j idats ^j Belarusian	throw	cëskac	Kashubian
throw k ⁱ idats ^j Belarusian	throw	mesti	Lithuanian
	throw	k ^j idats ^j	Belarusian

throw	xvxrl ^j əm	Bulgarian
throw	ha:zɛt	Czech
throw	męt	Latvian
throw	sviêž	Latvian
throw	xșcic	LowerSorbian
throw	fərli	Macedonian
throw	metati	OldChurchSlavic
throw	vræ∫ti	OldChurchSlavic
throw	metis	OldPrussian
throw	zutsate	Polish
throw	brəsat ^j	Russian
throw	bă:tsiti	SerboCroatian
throw	hojic	Slovak
throw	metă:ti	Slovenian
throw	kıdatı	Ukrainian
throw	mĕɛtat∫	UpperSorbian
throw	t∫isnə្t∫	UpperSorbian
tie	rzeszëc	Kashubian
tie	rišti	Lithuanian
tie	v ^j azats ^j	Belarusian
tie	vryzvəm	Bulgarian
tie	va:zat	Czech
tie	sìen	Latvian
tie	wizac	LowerSorbian
tie	vərze	Macedonian
tie	vẽzati	OldChurchSlavic
tie	perrēist	OldPrussian
tie	vjoũįzate	Polish
tie	v ^j azat ^j	Russian
tie	vě:zati	SerboCroatian
tie	viazac	Slovak

tie	vě:zati	Slovenian
tie	vjazatı	Ukrainian
tie	jazat∫	UpperSorbian
tongue	jazik	Belarusian
tongue	əzik	Bulgarian
tongue	jazık	Czech
tongue	jãzëk	Kashubian
tongue	mèle	Latvian
tongue	liežuvis	Lithuanian
tongue	jızşk	LowerSorbian
tongue	jazik	Macedonian
tongue	jẽzɯkŏ	OldChurchSlavic
tongue	insuwis	OldPrussian
tongue	jɛщ̃zə̯k	Polish
tongue	jizik	Russian
tongue	jězik	SerboCroatian
tongue	jazik	Slovak
tongue	jě:zik	Slovenian
tongue	jazık	Ukrainian
tongue	jazə̯k	UpperSorbian
tooth	zub	Belarusian
tooth	zvb	Bulgarian
tooth	zub	Czech
tooth	ząb	Kashubian
tooth	zòbs	Latvian
tooth	dantis	Lithuanian
tooth	zub	LowerSorbian
tooth	zab	Macedonian
tooth	zõbŭ	OldChurchSlavic
tooth	dantis	OldPrussian
tooth	zəmb	Polish
tooth	zub	Russian

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tooth	zû:b	SerboCroatian
tooth	zub	Slovak
tooth	zô:b	Slovenian
tooth	zub	Ukrainian
tooth	zub	UpperSorbian
tree	dreva	Belarusian
tree	dərvə	Bulgarian
tree	strom	Czech
tree	drzéwiã	Kashubian
tree	darva	Latvian
tree	kòks	Latvian
tree	medis	Lithuanian
tree	drėvė	Lithuanian
tree	bəm	LowerSorbian
tree	dərvə	Macedonian
tree	drævo	OldChurchSlavic
tree	garian	OldPrussian
tree	dzevo	Polish
tree	djerjevo	Russian
tree	dŗvə	SerboCroatian
tree	strom	Slovak
tree	drevô:	Slovenian
tree	dεrευο	Ukrainian
tree	∫təm	UpperSorbian
turn	skrãcac	Kashubian
turn	apsisukti	Lithuanian
turn	pavarotşvats ^j	Belarusian
turn	ubr≀∫təm	Bulgarian
turn	ədbət∫ıt	Czech
turn	ətət∫it	Czech
turn	grìež	Latvian
turn	vērš	Latvian
turn	krypti	Lithuanian

turn	wətbətsəc	LowerSorbian
turn	hobrocic	LowerSorbian
turn	vərti	Macedonian
turn	obratiti	OldChurchSlavic
turn	wartinna	OldPrussian
turn	odvratsate	Polish
turn	skrentsate	Polish
turn	pəvərat∫ivat ^j	Russian
turn	obř:nuti	SerboCroatian
turn	odbot∫ic	Slovak
turn	otot∫ic	Slovak
turn	obră∶t∫ati	Slovenian
turn	əbertatı	Ukrainian
turn	zwĕεrtn∮t∫	UpperSorbian
turn	wəbrət∫it∫	UpperSorbian
turn	wətbot∫it∫	UpperSorbian
two	dva	Belarusian
two	dva	Bulgarian
two	dva	Czech
two	dwa	Kashubian
two	divi	Latvian
two	du	Lithuanian
two	dvi	Lithuanian
two	dwa	LowerSorbian
two	dva	Macedonian
two	dŏva	OldChurchSlavic
two	dwai	OldPrussian
two	dva	Polish
two	dva	Russian
two	dvâ:	SerboCroatian

two	dva	Slovak
two	dvâ:	Slovenian
two	dva	Ukrainian
two	dwaj	UpperSorbian
vomit	wracac	Kashubian
vomit	vemti	Lithuanian
vomit	van ^j itavats ^j	Belarusian
vomit	puvrs∫təm	Bulgarian
vomit	zvratsɛt	Czech
vomit	vemj	Latvian
vomit	bl ^j uwac	LowerSorbian
vomit	povraca	Macedonian
vomit	bAĭvati	OldChurchSlavic
vomit	wimbmis	OldPrussian
vomit	zvratsatc	Polish
vomit	rvat ^j	Russian
vomit	rîgati	SerboCroatian
vomit	pŏvratcati	SerboCroatian
vomit	bʎŭvati	SerboCroatian
vomit	vratsac	Slovak
vomit	bljŭːvati	Slovenian
vomit	bljuvati	Ukrainian
vomit	bluwat∫	UpperSorbian
walk	jic	Kashubian
walk	eiti	Lithuanian
walk	is ^j ts ^j i	Belarusian
walk	xadz ^j its ^j	Belarusian
walk	xəd ^j ə	Bulgarian
walk	vərv ^j r	Bulgarian
walk	ji:t	Czech
walk	xəjit	Czech
walk	iêt	Latvian
walk	staĩgã	Latvian

walk	vaikščioti	Lithuanian
walk	học	LowerSorbian
walk	xəjzic	LowerSorbian
walk	odam	Macedonian
walk	iti	OldChurchSlavic
walk	xəditi	OldChurchSlavic
walk	xodzite	Polish
walk	ists	Polish
walk	xod ^j it ^j	Russian
walk	xð:dati	SerboCroatian
walk	ĭtei	SerboCroatian
walk	xəjic	Slovak
walk	i:sc	Slovak
walk	ĭ:ti	Slovenian
walk	xodĭ:ti	Slovenian
walk	xəditi	Ukrainian
walk	itı	Ukrainian
walk	kʰədʒit∫	UpperSorbian
walk	hit∫	UpperSorbian
warm	ts ⁱ opłi	Belarusian
warm	təpəł	Bulgarian
warm	tepli:	Czech
warm	cepłi	Kashubian
warm	sìlts	Latvian
warm	šiltas	Lithuanian
warm	ęspwę	LowerSorbian
warm	topol	Macedonian
warm	təplŭ	OldChurchSlavic
warm	ēnāistweī	OldPrussian
warm	tapīs	OldPrussian
warm	tcepw9	Polish

warm	t ^j opłij	Russian
warm	tôpao	SerboCroatian
warm	cepli:	Slovak
warm	tð:pəw	Slovenian
warm	tepłıj	Ukrainian
warm	t∫opw9	UpperSorbian
wash	mëc	Kashubian
wash	mazgoti	Lithuanian
wash	mits ^j	Belarusian
wash	mijə	Bulgarian
wash	mi:t	Czech
wash	mazgã	Latvian
wash	məc	LowerSorbian
wash	miɛ	Macedonian
wash	muti	OldChurchSlavic
wash	aumūsnan	OldPrussian
wash	mətc	Polish
wash	mit ^j	Russian
wash	prâti	SerboCroatian
wash	mic	Slovak
wash	mĭ:ti	Slovenian
wash	mītī	Ukrainian
wash	mət∫	UpperSorbian
water	vada	Belarusian
water	vu'da	Bulgarian
water	vəda	Czech
water	wòda	Kashubian
water	ûdens	Latvian
water	vanduo	Lithuanian
water	wəda	LowerSorbian
water	voda	Macedonian
water	vəda	OldChurchSlavic

water	unds	OldPrussian
water	wundan	OldPrussian
water	vəda	Polish
water	vəda	Russian
water	všda	SerboCroatian
water	vəda	Slovak
water	vð:da	Slovenian
water	voda	Ukrainian
water	woda	UpperSorbian
we	mi	Belarusian
we	niə	Bulgarian
we	mı	Czech
we	më	Kashubian
we	mẽs	Latvian
we	mes	Lithuanian
we	mə	LowerSorbian
we	nie	Macedonian
we	mu	OldChurchSlavic
we	mes	OldPrussian
we	mə	Polish
we	mi	Russian
we	mî:	SerboCroatian
we	mi	Slovak
we	mî:	Slovenian
we	mı	Ukrainian
we	mə	UpperSorbian
wet	məkri	Belarusian
wet	məkər	Bulgarian
wet	mokri:	Czech
wet	mòkri	Kashubian
wet	slapjš	Latvian
wet	šlapias	Lithuanian

wet	məkşə	LowerSorbian
wet	mokar	Macedonian
wet	məkrŭ	OldChurchSlavic
wet	məkrə	Polish
wet	məkrij	Russian
wet	môkar	SerboCroatian
wet	məkri:	Slovak
wet	mŏ:kər	Slovenian
wet	məkrıj	Ukrainian
wet	məkrə	UpperSorbian
what	ştə	Belarusian
what	kəkvə	Bulgarian
what	tso	Czech
what	со	Kashubian
what	kas	Latvian
what	kuris	Lithuanian
what	tsə	LowerSorbian
what	∫to	Macedonian
what	tʃĭtə	OldChurchSlavic
what	ka	OldPrussian
what	tsə	Polish
what	ştə	Russian
what	∫tô	SerboCroatian
what	t∫o	Slovak
what	kăːj	Slovenian
what	ştşə	Ukrainian
what	∫to	UpperSorbian
when	kal ^j i	Belarusian
when	ku'ga	Bulgarian
when	gdı	Czech
when	czedë	Kashubian
when	kad	Latvian

whengaLowerSorbianwhenkogaMacedonianwhenkogdaOldChurchSlaviawhenkögdaOldChurchSlaviawhenkoliOldChurchSlaviawhenkadanOldPrussianwhenkkedaPolishwhenkkedaRussianwhenkadaSerboCroatianwhenkadaSerboCroatianwhenkadaSlovakwhengdâ:jSlovenianwhenkoltUkrainianwhendaUpperSorbianwheredaCzechwheregdaCzechwherekadeBulgarianwherekameLithuanianwherekameLithuanianwherekadeMacedonianwherekadeMacedonianwheregdaSerboCroatianwheregdaSerboCroatianwherekadeMacedonianwheregdaSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSerboCroatianwheregdieSlovakwherekjë:Slovak	when	kada	Lithuanian
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whenkogdaOldChurchSlavidwhenkögdaOldChurchSlavidwhenkoliOldChurchSlavidwhenkadanOldPrussianwhenkiɛdaPolishwhenkiɛdaRussianwhenkiɛdaSerboCroatianwhenkɛdiSlovakwhengdâ:jSlovakwhengdâ:jSlovakwhendaUpperSorbianwhendaCzechwheredziɛBelarusianwheregdɛCzechwherekbrLatvianwherekaæMacedonianwherekaæMacedonianwherekaæMacedonianwherekabSlovenianwherekaæMacedonianwherekaæMacedonianwheregdɛSerboCroatianwheregdɛSlovakwheregdɛSlovakwheregdɛSlovakwheregdɛSlovakwheregdɛSlovakwheregdɛSlovakwheregdɛSlovakwheregdɛSlovakwheregdɛSlovak	when	koga	Macedonian
whenkŏgdaOldChurchSlaviawhenkoliOldChurchSlaviawhenkadanOldPrussianwhenkiɛdǫPolishwhenkiɛdǫPolishwhenkadaSerboCroatianwhenkɛdiSlovakwhengdâ:jSlovakwhenkɛdiSlovakwhendqâ:jSlovenianwhenkɛdiUpperSorbianwhendǫUpperSorbianwheredziɛBelarusianwheregdɛCzechwheredzeKashubianwherekbirLatvianwherekameLithuanianwherekadɛMacedonianwherekadɛMacedonianwhereködɛOldChurchSlaviawheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSlovakwherekjě:Slovak	when	kəgda	OldChurchSlavic
whenkəliOldChurchSlavidwhenkadanOldPrussianwhenkiɛdəPolishwhenkagdaRussianwhenkădaSerboCroatianwhenkɛdiSlovakwhengdâ:jSlovenianwhenkɛdiUkrainianwhendəUpperSorbianwheredziɛBelarusianwheregdɛCzechwheredzeKashubianwherekurLithuanianwherekurLithuanianwherekadɛMacedonianwherekadɛMacedonianwherekadɛOldChurchSlavidwherekadɛMacedonianwheregdɛClowerSorbianwhereködɛOldChurchSlavidwheregdiɛRussianwheregdiɛSerboCroatianwheregdiɛSlovakwheregdjɛSlovakwherekjě:Slovakwherekjě:Slovak	when	kŭgda	OldChurchSlavic
whenkadanOldPrussianwhenkiɛdəPolishwhenkagdaRussianwhenkădaSerboCroatianwhenkɛdiSlovakwhengdâ:jSlovakwhengdâ:jSlovenianwhenkəlıUkrainianwhendəUpperSorbianwheredziɛBelarusianwheregdɛCzechwheredzeKashubianwherekùrLatvianwherekirLithuanianwherekameLithuanianwherekadɛMacedonianwherekadɛOldChurchSlavidwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSlovakwheregdiɛSlovakwherekjě:Slovak	when	kəli	OldChurchSlavic
whenkiedaPolishwhenkagdaRussianwhenkădaSerboCroatianwhenkediSlovakwhengdâ:jSlovenianwhengdâ:jSlovenianwhenkəliUkrainianwhendaUpperSorbianwheredzieBelarusianwheregdaCzechwheregdaCzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherekadaMacedonianwherekadaOldChurchSlavidwheregdiaSerboCroatianwheregdiaSerboCroatianwheregdiaSerboCroatianwheregdiaSerboCroatianwheregdiaSerboCroatianwherekjě:Slovakwherekjě:Slovak	when	kadan	OldPrussian
whenkagdaRussianwhenkădaSerboCroatianwhenkɛdiSlovakwhengdâ:jSlovenianwhenkəlıUkrainianwhendąUpperSorbianwheredzieBelarusianwheregdɛCzechwheregdɛCzechwherekàrLatvianwherekirLatvianwherekaæLowerSorbianwherekaæMacedonianwherekaæMacedonianwherekadɛMacedonianwherekadɛOldChurchSlavidwheregdiɛRussianwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSerboCroatianwherekjě:Slovakwherekjě:Slovak	when	k ^j ɛdəฺ	Polish
whenkădaSerboCroatianwhenkɛdiSlovakwhengdâ:jSlovenianwhenkəlıUkrainianwhendaUpperSorbianwheredaBelarusianwheredaBulgarianwheregdɛCzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezɔLowerSorbianwherekadɛMacedonianwherekadɛOldChurchSlavicwheregdzɛPolishwheregdiɛSerboCroatianwheregdiɛSerboCroatianwheregdiɛSlovakwherekjě:Slovak	when	kagda	Russian
whenkɛdiSlovakwhengdâ:jSlovenianwhenkɔłıUkrainianwhendọUpperSorbianwheredziɛBelarusianwherekədɛBulgarianwheregdɛCzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezɔLowerSorbianwherekadɛMacedonianwherekadɛOldChurchSlavidwheregdzɛPolishwheregdjɛSerboCroatianwheregJiɛSlovakwherekjě:Slovak	when	kăda	SerboCroatian
when $gd\hat{a}$:jSlovenianwhenkohUkrainianwhen $d\hat{q}$ UpperSorbianwhere $dz^{j\epsilon}$ Belarusianwherekod ϵ Bulgarianwhere $gd\epsilon$ Czechwhere dze KashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherekad ϵ Macedonianwherekad ϵ OldChurchSlaviowheregd $z\epsilon$ Polishwheregd $z\epsilon$ Polishwheregd $j\hat{\epsilon}$ SerboCroatianwheregj $\hat{\epsilon}$ Slovakwherekjě:Slovenian	when	kedi	Slovak
whenkɔłıUkrainianwhendọUpperSorbianwheredziɛBelarusianwherekədɛBulgarianwheregdɛCzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezɔLowerSorbianwherekadɛMacedonianwhereködɛOldChurchSlavidwheregdiɛRussianwheregdiɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenian	when	gdâ:j	Slovenian
whendọUpperSorbianwheredzicBelarusianwherekədɛBulgarianwheregdɛCzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezɔLowerSorbianwherekadɛMacedonianwhereködɛOldChurchSlavidwheregdzɛPolishwheregdjɛRussianwheregdjɛSerboCroatianwheregJɛɛSlovakwherekjě:Slovenian	when	kəłı	Ukrainian
where $dz^{j_{E}}$ Belarusianwhere $k \Rightarrow d\epsilon$ Bulgarianwhere $gd\epsilon$ Czechwhere dze Kashubianwhere $k ù r$ LatvianwherekurLithuanianwherekameLithuanianwhere $z \Rightarrow$ LowerSorbianwherekadeMacedonianwhereködeOldChurchSlavidwheregd $z \epsilon$ Polishwheregd $j \epsilon$ Russianwheregd $j \epsilon$ SerboCroatianwheregj ϵ Slovakwherekjě:Slovakwherekjě:Slovenian	when	ęb	UpperSorbian
wherekədɛBulgarianwheregdɛCzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezɔLowerSorbianwherekadɛMacedonianwhereködɛOldChurchSlavidwheregdɛɛPolishwheregdɛɛRussianwheregdɛɛSerboCroatianwheregJɛɛSlovakwherekjě:Slovenian	where	dz ^j ε	Belarusian
where $gd\varepsilon$ CzechwheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezoLowerSorbianwherekadɛMacedonianwhereködɛOldChurchSlavidwheregdzɛPolishwheregdjɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenian	where	kəde	Bulgarian
wheredzeKashubianwherekùrLatvianwherekurLithuanianwherekameLithuanianwherezoLowerSorbianwherekadɛMacedonianwhereködɛOldChurchSlavidwherequeiOldPrussianwheregdzɛPolishwheregdjɛSerboCroatianwheregdjɛSlovakwheregdjɛSlovenian	where	gdɛ	Czech
wherekùrLatvianwherekurLithuanianwherekameLithuanianwhere z_0 LowerSorbianwherekadɛMacedonianwhereködɛOldChurchSlavidwherequeiOldPrussianwheregdzɛPolishwheregdjɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenian	where	dze	Kashubian
wherekurLithuanianwherekameLithuanianwhere z_0 LowerSorbianwherekadɛMacedonianwherekŏdɛOldChurchSlavidwherequeiOldPrussianwheregdzɛPolishwheregdjɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenian	where	kùr	Latvian
wherekameLithuanianwherezoLowerSorbianwherekadɛMacedonianwherekŏdɛOldChurchSlavidwherequeiOldPrussianwheregdzɛPolishwheregdjɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenian	where	kur	Lithuanian
where z_0 LowerSorbianwherekad ε Macedonianwherekŏd ε OldChurchSlaviawherequeiOldPrussianwheregd $z\varepsilon$ Polishwheregd $j\varepsilon$ Russianwheregd $j\hat{\varepsilon}$ SerboCroatianwhereg $j\hat{\varepsilon}$ Slovakwherek $\check{\xi}\check{\varepsilon}$ Slovenian	where	kame	Lithuanian
wherekadɛMacedonianwherekŏdɛOldChurchSlavidwherequeiOldPrussianwheregdzɛPolishwheregdjɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenian	where	ZO	LowerSorbian
wherekŏdɛOldChurchSlavidwherequeiOldPrussianwheregdzɛPolishwheregdʲɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenianwherekjě:Llkrainian	where	kade	Macedonian
wherequeiOldPrussianwheregdzɛPolishwheregdʲɛRussianwheregdjɛSerboCroatianwheregJɛSlovakwherekjě:Slovenianwherekjě:Llkrainian	where	kŭdɛ	OldChurchSlavic
where gdzε Polish where gdjε Russian where gdjε SerboCroatian where gjε Slovak where kjě: Slovenian	where	quei	OldPrussian
where gd ^j ε Russian where gdjê SerboCroatian where gjε Slovak where kjě: Slovenian	where	gdze	Polish
wheregdjêSerboCroatianwheregJeSlovakwherekjě:SlovenianwheredeUkrainian	where	gdje	Russian
where gJε Slovak where kjě: Slovenian where dε Ukrainian	where	gdjê	SerboCroatian
where kjč: Slovenian	where	đħε	Slovak
where de Ukrainian	where	kjě:	Slovenian
UKraillian	where	dε	Ukrainian

	1	1
where	dʒε	UpperSorbian
white	b ⁱ ɛłi	Belarusian
white	b ⁱ ał	Bulgarian
white	bi:li:	Czech
white	biôłi	Kashubian
white	baĨts	Latvian
white	baltas	Lithuanian
white	ф.	LowerSorbian
white	bel	Macedonian
white	bælŭ	OldChurchSlavic
white	gaylis	OldPrussian
white	bjaw <u>ə</u>	Polish
white	b ^j ɛłɨj	Russian
white	bjê:l	SerboCroatian
white	bieli	Slovak
white	bě:w	Slovenian
white	biłıj	Ukrainian
white	bıwə	UpperSorbian
who	xto	Belarusian
who	koj	Bulgarian
who	gdə	Czech
who	chto	Kashubian
who	kas	Latvian
who	kas	Lithuanian
who	xtə	LowerSorbian
who	koj	Macedonian
who	kŭto	OldChurchSlavic
who	kas	OldPrussian
who	ktə	Polish
who	ktə	Russian
who	tkô	SerboCroatian
who	ktə	Slovak

who	gdŏ:	Slovenian
who	xtə	Ukrainian
who	∫tu	UpperSorbian
wide	şɨrək ^j i	Belarusian
wide	∫irək	Bulgarian
wide	∫ırəki:	Czech
wide	szeroczi	Kashubian
wide	plats	Latvian
wide	platus	Lithuanian
wide	şərəki	LowerSorbian
wide	∫irək	Macedonian
wide	∫irəkŏ	OldChurchSlavic
wide	şerək ^j i	Polish
wide	şirək ^j ij	Russian
wide	∫ĭrək	SerboCroatian
wide	∫irəki:	Slovak
wide	∫irək	Slovenian
wide	şırəkıj	Ukrainian
wide	∫iroki	UpperSorbian
wife	zənka	Belarusian
wife	zəna	Bulgarian
wife	manʒɛlka	Czech
wife	białka	Kashubian
wife	slëbnô	Kashubian
wife	siẽva	Latvian
wife	žmona	Lithuanian
wife	zenska	LowerSorbian
wife	zena	Macedonian
wife	зєпа	OldChurchSlavic
wife	gennan	OldPrussian
wife	zəna	Polish
wife	zɛna	Russian

		1
wife	3ěna	SerboCroatian
wife	manʒɛlka	Slovak
wife	ʒĕ́:na	Slovenian
wife	druzına	Ukrainian
wife	30na	UpperSorbian
wind	v ^j ɛts ^j ɛr	Belarusian
wind	v ^j atər	Bulgarian
wind	vi:tŗ	Czech
wind	wiater	Kashubian
wind	vẽjš	Latvian
wind	vėjas	Lithuanian
wind	witş	LowerSorbian
wind	vetar	Macedonian
wind	vætrŏ	OldChurchSlavic
wind	wetro	OldPrussian
wind	vjatr	Polish
wind	v ^j et ^j er	Russian
wind	vjêtar	SerboCroatian
wind	vietor	Slovak
wind	vê:tər	Slovenian
wind	viter	Ukrainian
wind	wītsik	UpperSorbian
wing	kriło	Belarusian
wing	kriło	Bulgarian
wing	kŗti:dlə	Czech
wing	skrzidło	Kashubian
wing	spārns	Latvian
wing	sparnas	Lithuanian
wing	keidwo	LowerSorbian
wing	krilə	Macedonian
wing	krilo	OldChurchSlavic
wing	skreīlē	OldPrussian

wing	skşədwə	Polish
wing	kriło	Russian
wing	krĭ:lə	SerboCroatian
wing	kri:dlo	Slovak
wing	krĭ:lo	Slovenian
wing	krīło	Ukrainian
wing	k∫idwo	UpperSorbian
wipe	wëcerac	Kashubian
wipe	šluoti	Lithuanian
wipe	vits ^j irats ^j	Belarusian
wipe	brr∫ə	Bulgarian
wipe	iztrivəm	Bulgarian
wipe	vici:rat	Czech
wipe	slaũka	Latvian
wipe	wətr ^j ıc	LowerSorbian
wipe	bri∫ε	Macedonian
wipe	tŗ ^j ti	OldChurchSlavic
wipe	træti	OldChurchSlavic
wipe	vətceratc	Polish
wipe	vit ^j irat ^j	Russian
wipe	brîsati	SerboCroatian
wipe	triec	Slovak
wipe	brĭ:sati	Slovenian
wipe	vıtıratı	Ukrainian
wipe	trit∫	UpperSorbian
with	Z	Belarusian
with	SYS	Bulgarian
with	Sε	Czech
with	Z	Kashubian
with	ar	Latvian
with	su	Lithuanian
with	san	Lithuanian
with	ZE	LowerSorbian

with	sə	Macedonian
with	sŭ	OldChurchSlavic
with	sen	OldPrussian
with	Zε	Polish
with	s	Russian
with	sa	SerboCroatian
with	sə	Slovak
with	Z	Slovenian
with	Z	Ukrainian
with	Zε	UpperSorbian
woman	zantşina	Belarusian
woman	zəna	Bulgarian
woman	zena	Czech
woman	białka	Kashubian
woman	siẽviẽte	Latvian
woman	moteris	Lithuanian
woman	zenska	LowerSorbian
woman	zena	Macedonian
woman	zena	OldChurchSlavic
woman	gennan	OldPrussian
woman	kobjeta	Polish
woman	zɛn∫ina	Russian
woman	зěna	SerboCroatian
woman	zena	Slovak
woman	3ĕ∶na	Slovenian
woman	zinka	Ukrainian
woman	зэпа	UpperSorbian
woods	ljes	Belarusian
woods	gu'ra	Bulgarian
woods	les	Czech
woods	miškas	Lithuanian
woods	mežs	Latvian

woods	gəl ^j a	LowerSorbian
woods	∫uma	Macedonian
woods	gora	Macedonian
woods	læsŭ	OldChurchSlavic
woods	median	OldPrussian
woods	las	Kashubian
woods	las	Polish
woods	l ^j es	Russian
woods	∫ûma	SerboCroatian
woods	les	Slovak
woods	gəzd	Slovenian
woods	l ^j is	Ukrainian
woods	līs	UpperSorbian
worm	tşarv ^j ak	Belarusian
worm	t∫εrvəj	Bulgarian
worm	t∫εrv	Czech
worm	robôk	Kashubian
worm	tā̀rps	Latvian
worm	kirmėlė	Lithuanian
worm	sliekas	Lithuanian
worm	tser	LowerSorbian
worm	tsərv	Macedonian
worm	t∫ŗ ^j vĭ	OldChurchSlavic
worm	slayx	OldPrussian
worm	rəbak	Polish
worm	t∫εrv ^j	Russian
worm	t∫r̃:v	SerboCroatian
worm	t∫εrv	Slovak
worm	t∫ô:rw	Slovenian
worm	tşervjak	Ukrainian
worm	t∫er	UpperSorbian

year	γəd	Belarusian
year	gudinə	Bulgarian
year	rək	Czech
year	rok	Kashubian
year	gads	Latvian
year	metai	Lithuanian
year	linto	LowerSorbian
year	godina	Macedonian
year	lætə	OldChurchSlavic
year	mettan	OldPrussian
year	rək	Polish
year	god	Russian
year	gôdina	SerboCroatian
year	rək	Slovak
year	lě:to	Slovenian
year	r ^j ik	Ukrainian
year	lıtə	UpperSorbian
yellow	zəwti	Belarusian
yellow yellow	zəwt i 3rłt	Belarusian Bulgarian
yellow yellow yellow	zəwti 3xłt 3luti:	Belarusian Bulgarian Czech
yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti	Belarusian Bulgarian Czech Kashubian
yellow yellow yellow yellow yellow	zəwti 3xlt 3luti: żôłti dzęÎtęns	Belarusian Bulgarian Czech Kashubian Latvian
yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęltęns geltonas	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian
yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęÎtęns geltonas zowtạ	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian LowerSorbian
yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęÎtęns geltonas zowt9 30lt	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian LowerSorbian Macedonian
yellow yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęÎtęns geltonas zowtạ 3olt 3ljitŏ	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian LowerSorbian Macedonian
yellow yellow yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęÎtęns geltonas zowt9 3olt 3,litŏ gelatynan	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian LowerSorbian Macedonian OldChurchSlavic OldPrussian
yellow yellow yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęltęns geltonas zowtạ 3olt 3l ^j itŏ gelatynan zuwtą	Belarusian Bulgarian Czech Kashubian Latvian Lithuanian LowerSorbian Macedonian OldChurchSlavic OldPrussian Polish
yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęÎtęns geltonas zowt9 3olt 3 ^l itŏ gelatynan zuwt9 zołtij	BelarusianBulgarianCzechKashubianLatvianLithuanianLowerSorbianMacedonianOldChurchSlavicOldPrussianPolishRussian
yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęltęns geltonas zowta 3olt 3l ^j ttŏ gelatynan zuwta zołtij 3û:t	BelarusianBulgarianCzechKashubianLatvianLithuanianLowerSorbianMacedonianOldChurchSlavicOldPrussianPolishRussianSerboCroatian
yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow yellow	zəwti 3xłt 3luti: żôłti dzęÎtęns geltonas zowta 3olt 3lltă gelatynan zuwta zołtij 3û:t 3lti:	BelarusianBulgarianCzechKashubianLatvianLithuanianLowerSorbianMacedonianOldChurchSlavicOldPrussianPolishRussianSerboCroatianSlovak

yellow	zəvtij	Ukrainian
yellow	30tə	UpperSorbian
yellow	verdhë	Albanian
yellow	zairitō	Avestan
yellow	zairiš	Avestan
yellow	ksant ^h ós	Greek
yellow	gelo	OldHighGerman
yellow	bore	Ossetian
you	vi	Belarusian
you	eiv	Bulgarian
you	VI	Czech
you	wa	Kashubian
you	jũs	Latvian
you	wş	LowerSorbian
you	viɛ	Macedonian
you	vui	OldChurchSlavic
you	ioūs	OldPrussian
you	ęv	Polish
you	vi	Russian
you	vî:	SerboCroatian
you	vi	Slovak
you	vî:	Slovenian
you	טו	Ukrainian
you	wọ	UpperSorbian
you	jūs	Lithuanian
you	ju	Albanian
you	vō	Avestan
you	yūžəm	Avestan
you	jūs	Gothic
you	hy:mê:s	Greek
you	iuwih	OldHighGerman
you	sumaχ	Ossetian

APPENDIX B

SOURCE CODE

```
# Basic ALINE algorithm taken from NLTK
# ALINE for multiple languages created following
# LingPy standards as best as possible
# === Constants ===
inf = float('inf')
# Default values for maximum similarity scores (Kondrak 2002: 54)
C skip = 10 \# Indels
C sub = 35 # Substitutions
C exp = 45 # Expansions/compressions
C vwl = 5 # Vowel/consonant relative weight (decreased from 10)
# Basic consonant list. Can be edited with additional symbols.
consonants = ['B', 'N', 'R', 'b', 'c', 'd', 'f', 'g', 'h', 'j', 'k', 'l',
'm', 'n', 'p', 'q', 'r', 's', 't', 'v', 'x', 'z', 'ç', 'ð', 'ħ', 'ŋ', 'd',
'θ', 'χ', 'ҳ', 'w']
# Relevant features for comparing consonants and vowels
R c = ['aspirated', 'lateral', 'manner', 'nasal', 'place', 'retroflex',
       'syllabic', 'voice']
# 'high' taken out of R v because same as manner
R v = ['back', 'lateral', 'long', 'manner', 'nasal', 'place',
       'retroflex', 'round', 'syllabic', 'voice']
# Basic feature list. Additional features, such as palatalization
# can be added as necessary.
# Flattened feature matrix (Kondrak 2002: 56)
similarity matrix = {
   #place
   'bilabial': 1.0, 'labiodental': 0.95, 'dental': 0.9,
   'alveolar': 0.85, 'retroflex': 0.8, 'palato-alveolar': 0.75,
   'palatal': 0.7, 'velar': 0.6, 'uvular': 0.5, 'pharyngeal': 0.3,
   'glottal': 0.1, 'labiovelar': 1.0, 'vowel': -1.0, # added 'vowel'
   #manner
   'stop': 1.0, 'affricate': 0.9, 'fricative': 0.85, # increased fricative
from 0.8
   'trill': 0.7, 'tap': 0.65, 'approximant': 0.6, 'high vowel': 0.4,
   'mid vowel': 0.2, 'low vowel': 0.0, 'vowel2': 0.5, # added vowel
   #high
  'high': 1.0, 'mid': 0.5, 'low': 0.0,
  #back
  'front': 1.0, 'central': 0.5, 'back': 0.0,
  #binary features
  'plus': 1.0, 'minus': 0.0
}
# Relative weights of phonetic features (Kondrak 2002: 55)
salience = {
   'syllabic': 5,
   'place': 40,
   'manner': 50,
```

```
'voice': 5, # decreased from 10
   'nasal': 20, # increased from 10
   'retroflex': 10,
   'lateral': 10,
   'aspirated': 5,
   'long': 0, # decreased from 1
   'high': 3, # decreased from 5
   'back': 2, # decreased from 5
   'round': 2 # decreased from 5
}
# Example symbol-feature matrix correspondences
# Every symbol, both vowels and consonants, needs a corresponding
# feature matrix
# (Kondrak 2002: 59-60)
feature matrix = {
# Consonants
'p': {'place': 'bilabial', 'manner': 'stop', 'syllabic': 'minus', 'voice':
'minus',
'nasal': 'minus', 'retroflex': 'minus', 'lateral': 'minus', 'aspirated':
'minus'},
'b': {'place': 'bilabial', 'manner': 'stop', 'syllabic': 'minus', 'voice':
'plus',
'nasal': 'minus', 'retroflex': 'minus', 'lateral': 'minus', 'aspirated':
'minus'},
't': {'place': 'alveolar', 'manner': 'stop', 'syllabic': 'minus', 'voice':
'minus',
'nasal': 'minus', 'retroflex': 'minus', 'lateral': 'minus', 'aspirated':
'minus'},
'd': {'place': 'alveolar', 'manner': 'stop', 'syllabic': 'minus', 'voice':
'plus',
'nasal': 'minus', 'retroflex': 'minus', 'lateral': 'minus', 'aspirated':
'minus'},
't': {'place': 'retroflex', 'manner': 'stop', 'syllabic': 'minus',
'voice': 'minus',
'nasal': 'minus', 'retroflex': 'plus', 'lateral': 'minus', 'aspirated':
'minus'},
'd': {'place': 'retroflex', 'manner': 'stop', 'syllabic': 'minus',
'voice': 'plus',
'nasal': 'minus', 'retroflex': 'plus', 'lateral': 'minus', 'aspirated':
'minus'},
'c': {'place': 'palatal', 'manner': 'stop', 'syllabic': 'minus', 'voice':
'minus',
'nasal': 'minus', 'retroflex': 'minus', 'lateral': 'minus', 'aspirated':
'minus'},
'j': {'place': 'palatal', 'manner': 'stop', 'syllabic': 'minus', 'voice':
'plus',
```

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class Aline(Wordlist):

```
"""Basic class for handling the ALINE calculations"""
    def init (self,filename, **keywords):
        kw={"segments":"tokens",
            "numbers": "numbers",
            "transcription":"ipa",
            "langid":"langid",
            "duplicates": "duplicates",
            "tokenize":ipa2tokens,
            "cogid":"Aline ID"
            }
        kw.update(keywords)
        self. segments = kw['segments']
        self. numbers = kw['numbers']
        self. langid = kw['langid']
        self. duplicates = kw['duplicates']
        self._transcription = kw['transcription']
        self. cogid=kw['cogid']
        Wordlist. init (self, filename)
       assert self. segments in self.header or self. transcription in
     self.header
        if self. langid not in self.header:
            transform = dict(zip(self.taxa, [str(i + 1) for i in
range(self.width)]))
            self.add entries(self. langid, self. col name, lambda x:
transform[x])
    def get lists(self):
        """ get lists of IPA entries for each language"""
        lang dict={}
        for taxon in self.taxa:
            lang dict[taxon]=self.get list(col=taxon, entry='ipa')
        return lang dict
    def aline lists(self):
     """Align all of the languages in a wordlist using the ALINE
algorithms """
        alm dict={}
        dist dict={}
        lang form dict=self.get lang dicts()
        for pair in self.get pairs list():
            lang1=pair[0]
            lang2=pair[1]
            dict1=lang form dict[lang1]
            dict2=lang_form_dict[lang2]
            form list={}
```

```
dist list={}
            get keys=set(dict1.keys()).intersection(dict2.keys())
            for key in get keys:
                if len(dict1[key]) >1:
                    for k in range(len(dict1[key])):
                        alm1={key:align(dict1[key][k],dict2[key][0])}
distance={key:round(aline dist(dict1[key][k],dict2[key][0]),3)}
                        dist list.update(distance)
                        form list.update(alm1)
                elif len(dict2[key]) >1:
                    for k in range(len(dict2[key])):
                        alm1={key:align(dict1[key][0],dict2[key][k])}
distance={key:round(aline dist(dict1[key][0],dict2[key][k]),3)}
                        form list.update(alm1)
                        dist list.update(distance)
                else:
                    alm1={key:align(dict1[key][0],dict2[key][0])}
distance={key:round(aline dist(dict1[key][0],dict2[key][0]),3)}
                    form list.update(alm1)
                    dist list.update(distance)
            alm dict.update({pair:form list})
            dist dict.update({pair:dist list})
        return dist dict, alm dict
    def aline cluster(self, threshold):
     """Cluster the aligned words into cognate sets based on the user-
defined distance threshold"""
        clust dict={}
        dist dict=self.aline lists()[0]
        for concept in self.concept:
            concept list=[]
            lang list={}
            for pair in self.get pairs list():
                if concept in dist dict[pair]:
                    concept list.append(dist dict[pair][concept])
                    lang list.update({pair[0]:1})
                    lang list.update({pair[1]:1})
                else:
                    pass
            matrix=squareform(concept list)
            cluster=flat upgma(0.3,matrix,sorted(lang list))
            clust dict.update({concept:cluster})
        return clust dict
```

def get cognate ids(self,threshold):

```
"""Get the ALINE IDs for the clustered words"""
        clust dict=self.aline cluster(threshold)
        counter=0
        counter2=0
        con count=1
        cog id list=[]
        cog id dict={}
        ids dict={}
        for concept in self.concept:
            cog dict={}
            for idx in clust_dict[concept]:
                counter3=0
                counter+=1
                if len(clust dict[concept][idx]) >1:
                    for i in range(len(clust dict[concept][idx])):
                        counter2+=1
                        cog_id_list.append(counter)
cog dict.update({clust dict[concept][idx][i]:counter})
                        ids dict.update({counter2:counter})
                        print(counter2, concept,
clust dict[concept][idx][counter3], counter)
                        counter3+=1
                else:
                    counter2+=1
                    cog id list.append(counter)
                    cog dict.update({clust dict[concept][idx][0]:counter})
                    ids dict.update({counter2:counter})
                    print(counter2, concept,
clust dict[concept][idx][counter3], counter)
            cog id dict.update({concept:cog dict})
            con count+=1
            print('#')
        return cog_id_list, cog_id_dict, ids_dict
    def add ids(self,threshold):
      """Add the ALINE IDs to the wordlist"""
        ids=self.get cognate ids(threshold)[2]
        self.add entries('AlineID',ids, util.identity)
    def add alines(self):
      """Add the optimal alignments to the wordlist"""
        alms=self.aline lists()[1]
        self.add entries('Aline', alms, util.identity)
    def get pairs list(self):
      """Create all of the language pairs"""
        lang list=self.languages
        pairs=itertools.combinations(lang list,2)
        pair list=list(pairs)
        return pair list
```

```
def get lang dicts(self):
     """Get dictionaries of all words in the wordlist for each
languages"""
        lang form dict={}
        for language in self.languages:
            temp dict=self.get dict(col=language,entry='ipa')
            lang form dict.update({language:temp dict})
        return lang form dict
    def lang dist(self):
      """Find the ALINE distances between languages"""
        dist dict=self.aline lists()[0]
        lang dist dict=dist dict
        for key in lang dist dict:
            for k in lang dist dict[key]:
                val=np.array(lang_dist_dict[key][k]).astype(np.float)
            a=round(np.mean(val),3)
            lang dist dict.update({key:a})
        return lang dist dict
    def cluster langs(self):
     """Cluster the languages based on the ALINE distances"""
        dist dict=self.lang dist()
        cluster list=[]
        for key in dist dict:
            cluster list.append(dist dict[key])
        matrix=squareform(cluster list)
        cluster=flat upgma(0.3, matrix, self.taxa)
        return cluster, matrix
    def getitem (self,idx):
        if idx in self. data:
            return self. data[idx]
        try:
            return
(self. data[idx[0][0]][self. header[self. alias[idx[1]]]],
self._data[idx[0][1]][self._header[self._alias[idx[1]]]])
        except (IndexError, TypeError, KeyError):
            try:
                return
self. data[idx[0]][self. header[self. alias[idx[1]]]]
            except KeyError:
                return
            except TypeError:
                raise KeyError("The key [0] could not be
found.".format(idx))
    def get subset(self, sublist, ref='concept'):
        self.subsets={}
        for tA,tB in util.multicombinations2(self.taxa):
```

```
self.subsets[tA,tB]=[pair for pair in self.pairs[tA,tB] if
self[pair,ref][0] in sublist]
    def output(self, fileformat, **keywords):
        kw = dict(filename=self.filename, defaults=False)
        kw.update(keywords)
        self. output(fileformat, **kw)
def align(str1,str2, epsilon=0):
    .. .. ..
    Compute the alignment of two phonetic strings.
    :type str1, str2: str
    :param str1, str2: Two strings to be aligned
    :type epsilon: float (0.0 to 1.0)
    :param epsilon: Adjusts threshold similarity score for near-optimal
alignments
    :rtpye: list(list(tuple(str, str)))
    :return: Alignment(s) of str1 and str2
    (Kondrak 2002: 51)
    .. .. ..
    if np == None:
        raise ImportError ('You need numpy in order to use the align
function')
    assert 0.0 <= epsilon <= 1.0, "Epsilon must be between 0.0 and 1.0."
    m = len(str1)
    n = len(str2)
    # This includes Kondrak's initialization of row 0 and column 0 to all
0s.
    S = np.zeros((m+1, n+1), dtype=float)
    # If i <= 1 or j <= 1, don't allow expansions as it doesn't make</pre>
sense,
    # and breaks array and string indices. Make sure they never get chosen
    # by setting them to -inf.
    for i in range(1, m+1):
        for j in range(1, n+1):
            edit1 = S[i-1, j] + sigma skip(str1[i-1])
            edit2 = S[i, j-1] + sigma skip(str2[j-1])
            edit3 = S[i-1, j-1] + sigma sub(str1[i-1], str2[j-1])
            if i > 1:
                edit4 = S[i-2, j-1] + sigma exp(str2[j-1], str1[i-2:i])
            else:
                edit4 = -inf
            if j > 1:
                edit5 = S[i-1, j-2] + sigma exp(str1[i-1], str2[j-2:j])
            else:
                edit5 = -inf
```

```
S[i, j] = max(edit1, edit2, edit3, edit4, edit5, 0)
    T = (1-epsilon)*np.amax(S) # Threshold score for near-optimal
alignments
    alignments = []
    for i in range(1, m+1):
        for j in range(1, n+1):
            if S[i,j] >= T:
                alignments.append( retrieve(i, j, 0, S, T, str1, str2,
[]))
    return alignments
def retrieve(i, j, s, S, T, str1, str2, out):
    <del>..</del>....
    Retrieve the path through the similarity matrix S starting at (i, j).
    :rtype: list(tuple(str, str))
    :return: Alignment of str1 and str2
    ** ** **
    if S[i, j] == 0:
        return out
    else:
        if j > 1 and S[i-1, j-2] + sigma exp(str1[i-1], str2[j-2:j]) + s
>= T:
            out.insert(0, (str1[i-1], str2[j-2:j]))
            retrieve(i-1, j-2, s+sigma exp(str1[i-1], str2[j-2:j]), S, T,
str1, str2, out)
        elif i > 1 and S[i-2, j-1] + sigma exp(str2[j-1], str1[i-2:i]) + s
>= T:
            out.insert(0, (str1[i-2:i], str2[j-1]))
            retrieve(i-2, j-1, s+sigma exp(str2[j-1], str1[i-2:i]), S, T,
str1, str2, out)
        elif S[i, j-1] + sigma skip(str2[j-1]) + s >= T:
            out.insert(0, ('-', str2[j-1]))
            retrieve(i, j-1, s+sigma skip(str2[j-1]), S, T, str1, str2,
out)
        elif S[i-1, j] + sigma skip(str1[i-1]) + s >= T:
            out.insert(0, (str1[i-1], '-'))
            _retrieve(i-1, j, s+sigma_skip(str1[i-1]), S, T, str1, str2,
out)
        elif S[i-1, j-1] + sigma sub(str1[i-1], str2[j-1]) + s >= T:
            out.insert(0, (str1[i-1], str2[j-1]))
            retrieve(i-1, j-1, s+sigma sub(str1[i-1], str2[j-1]), S, T,
str1, str2, out)
    return out
def sigma skip(p):
    .....
    Returns score of an indel of P.
    (Kondrak 2002: 54)
```

```
return C skip
def sigma sub(p,q):
    ......
    Returns score of a substitution of P with Q.
    (Kondrak 2002: 54)
    .....
    return C sub - delta(p, q) - V(p) - V(q)
def sigma exp(p,q):
    11 11 11
    Returns score of an expansion/compression.
    (Kondrak 2002: 54)
    ......
    q1 = q[0]
    q^2 = q[1]
    return C exp - delta(p, q1) - delta(p, q2) - V(p) - max(V(q1), V(q2))
def delta(p,q):
    .....
    Return weighted sum of difference between P and Q.
    (Kondrak 2002: 54)
    ** ** **
    features = R(p, q)
    total = 0
    for f in features:
        total += diff(p, q, f) * salience[f]
    return total
def diff(p,q,f):
    .. .. ..
    Returns difference between phonetic segments P and Q for feature F.
    (Kondrak 2002: 52, 54)
    ......
    p features, q features = feature matrix[p], feature matrix[q]
    if f=='place':
        return abs(place matrix[p features[f]]-
place matrix[q features[f]])
    elif f=='manner':
        return abs(manner matrix[p features[f]]-
manner matrix[q features[f]])
    elif f=='high':
        return abs(high matrix[p features[f]]-high matrix[q features[f]])
    elif f=='back':
        return abs(back matrix[p features[f]]-back matrix[q features[f]])
```

......

```
elif
f=='long'or'round'or'voice'or'nasal'or'lateral'or'aspirated'or'syllabic'or
'retroflex'\
            or 'palatalized' or 'tense' or 'offglide':
        return abs(binary matrix[p features[f]]-
binary matrix[q features[f]])
def sim(p,q):
    ""return similarity score for two segments"""
    assert 0.0 <= epsilon <= 1.0, "Epsilon must be between 0.0 and 1.0."
    seg dist=delta(p,q)
    m = len(p)
    n = len(q)
    # This includes Kondrak's initialization of row 0 and column 0 to all
0s.
    S = np.zeros((m+1, n+1), dtype=float)
    # If i <= 1 or j <= 1, don't allow expansions as it doesn't make</pre>
sense,
    # and breaks array and string indices. Make sure they never get chosen
    # by setting them to -inf.
    for i in range(1, m+1):
        for j in range(1, n+1):
            edit1 = S[i-1, j] + sigma skip(p[i-1])
            edit2 = S[i, j-1] + sigma skip(q[j-1])
            edit3 = S[i-1, j-1] + sigma sub(p[i-1], q[j-1])
            if i > 1:
                edit4 = S[i-2, j-1] + sigma exp(q[j-1], p[i-2:i])
            else:
                edit4 = -inf
            if j > 1:
                edit5 = S[i-1, j-2] + sigma exp(p[i-1], q[j-2:j])
            else:
                edit5 = -inf
            S[i, j] = max(edit1, edit2, edit3, edit4, edit5, 0)
    return S[i, j]
def aline sim(str1,str2):
    ""get the similiarity scoree for two strings"""
    total sim=0
    for p,q in zip(str1,str2):
        total sim + = sim(p,q)
    return total sim
def normal sim(str1, str2):
    """Normalized similarity score as taken from Downey et al. (2008)"""
    return
((2*aline sim(str1,str2))/(aline sim(str1,str1)+aline sim(str2,str2)))
def aline dist(str1,str2):
    """True distance statistics as proposed by Downey et al. (2008)"""
    return 1-normal sim(str1, str2)
```

```
def R(p,q):
    .....
    Return relevant features for segment comparsion.
    (Kondrak 2002: 54)
    11 11 11
    if p in consonants or q in consonants:
       return R_c
    else:
       return R_v
def V(p):
    .....
    Return vowel weight if P is vowel.
    (Kondrak 2002: 54)
    ** ** **
    if p in consonants:
        return O
    return C_vwl
```