Definiteness in languages with and without articles

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Introduction

- There are many accounts for definiteness, however, most rely on language-specific expressions, e.g. definite articles.
- Although comparative studies exist, no empirically based cross-linguistic study seems to be available yet that makes expressions of definiteness comparable directly.
- This pilot study explores the possibilities of parallel texts for comparing the expression of definiteness in languages with and without articles.
- The languages we examined are German, Hungarian, Russian, and Chinese.

Definiteness

Definiteness has been associated with the following concepts:

- uniqueness (Frege 1892; Strawson 1950; Heim & Kratzer 1998; Stanley & Gendler Szabó 2000)
- familiarity (Heim 1988; Roberts 2003; Chierchia 1995)
- identifiability (e.g. Birner & Ward 1994; Schroeder 2011)
- anaphora (e.g. Ariel 1988, 2001) and bridging (Clark 1975)
- quantification (Löbner 1985; Kamp 2002)

Definiteness (Dryer 2013, 2014)

(main focus: classification of articles)

Reference hierarchy

anaphoric definites definite noun phrases that refer back in the discourse

non-anaphoric definites based on shared knowledge of the speaker and hearer

pragmatically specific indefinites subsequent reference, introduce a participant into the discourse that is referred to again in the subsequent discourse

semantically specific associated with an entailment of existence

semantically nonspecific not associated with an entailment of existence

Outline of the present study

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- Comparison of the coding strategies for (in)definiteness in four languages based on parallel texts.
- Parallel texts are necessary, as they ensure that the situations of use are directly comparable in the different languages.
- The corpus: 4 movies (Inception, Noah, Frozen, Avatar)
- From those subtitles, 295 referring expressions with sufficient similarity have been extracted for German, Hungarian, Chinese, and Russian.
- In total, we annotated 1180 tokens.

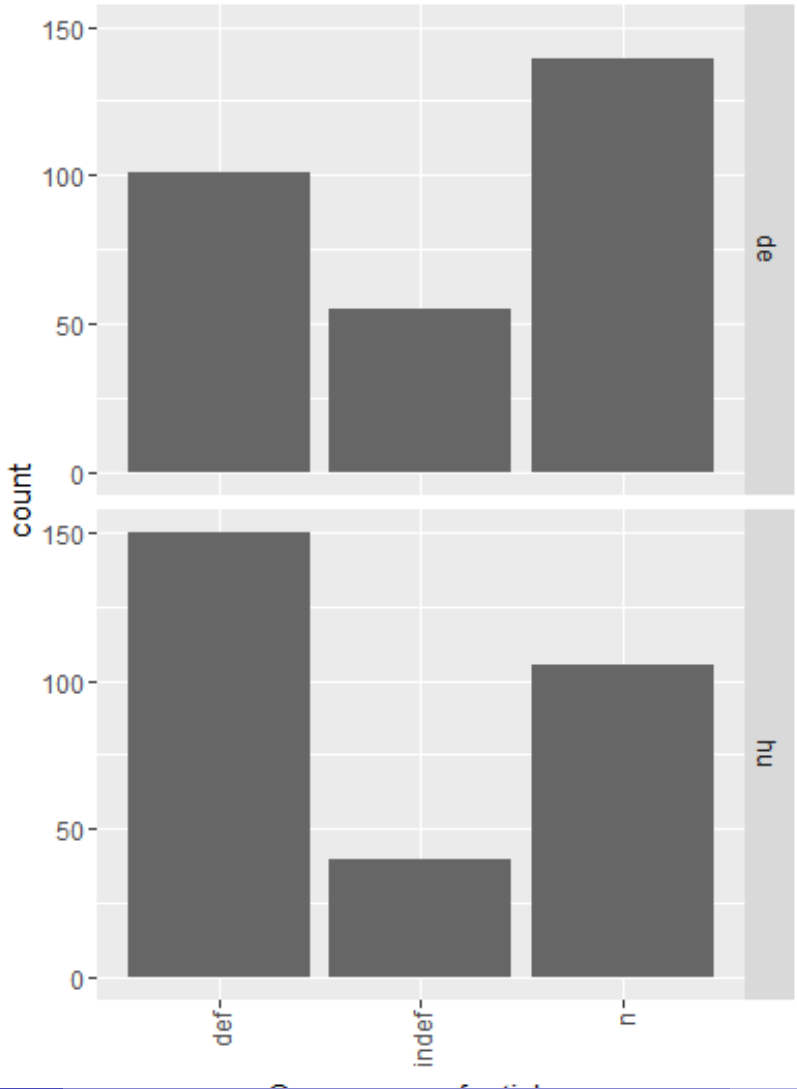
Annotation

- **noun.type** count, mass, proper, person, place
- **animacy** y, n
- **givenness** referential properties (definiteness)
  - def.d: deictic
  - def.a: anaphoric
  - def.su: situational unique
  - spec.p: pragmatically specific
  - spec.s: semantically specific
  - non.spec: non-specific
  - generic
- **synt.pos** S, O, obl, attr, pred
- **article** def, indef, n
- **poss** y, n
- **dem** y, n
- **adj** y, n
- **other.attr** y, n
- **bare.noun** y, n
- **pronoun** n, y, drop
- **number** sg, pl

y=yes, present
n=no, not present

The use of articles

Article frequencies



Bare noun vs. indefinite article

In predicative uses, Hungarian often lacks the indefinite article.

(1) *I am **a** **man**.*

de *Ich bin **ein** **Mann**.*

hu ***Ember** vagyok*.
man am

zh *wo shi **yi** **ge** **ren***.
I COP one CL man

ru *Я **человек***!
I man

Definite article vs. adnominal demonstrative

German uses the definite article in contexts, where the other languages require a demonstrative.

(2) *That allows us to get right in the middle of* ***that*** ***process****.*

de *Das erlaubt uns, mitten in* ***den*** ***Prozess***
that allows us in.the.middle into the process
einzusteigen.
enter

hu *ez az, amiért bele tudunk szólni* ***ebbe*** ***a*** ***folyamatba***.
this that why in can.2PL say this.in the process.in

zh *women jiu neng zhijie jinru* ***zhe*** ***ge*** ***guocheng***.
we ADV can directly get.into this CL process

ru *Это позволяет нам проникать внутрь* ***этого***
this allows us permeate inside.ACC this.GEN
процесса.
proccess.GEN

Factors determining the use of articles

Random forests (e.g. Baayen & Tagliamonte 2012; Baayen et al. 2008) can help to determine the strength of factors, i.e. how much those properties are correlated with the uses of articles.

What are random forests?

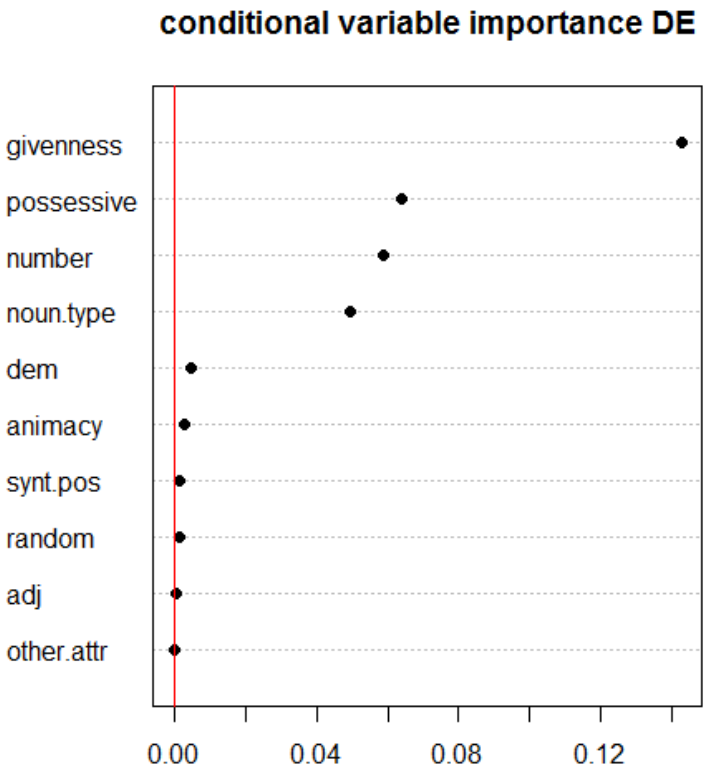
- Random forests are based on a large number of conditional inference trees of random sub-samples of the data.
- Trees split the data according to the factor that makes the purest groups with the smallest p value with respect to the value that we want to test (article).
- Growing a large number of trees allows to control for factors that depend on each other and
- smaller effects, otherwise hidden by more influential factors, can also be considered.

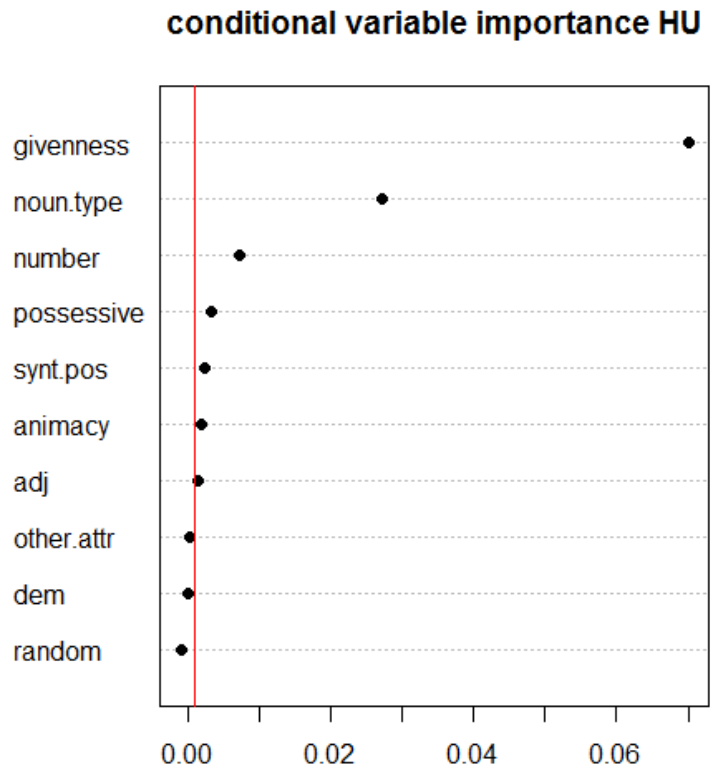
The following factors have been considered here:

`art ~ synt.pos + poss + dem + adj + other.attr + number + noun.type + animacy + givenness`

Factors determining the use of articles

Based on the random forest model, conditional variable importance measures the importance of the factors:
The values for a factor are randomly manipulated. The greater the impact on the accuracy of the prediction, the more important the factor is. If the random values of a factor do not influence the accuracy of the prediction of the model, the factor has no significant overall influence (to the left of the red line).





Factors determining the use of articles

- In both languages, `givenness` (definiteness) determines most the use of articles.
- Also, the semantic properties of the referent (`noun.type`) play a role.
- `Possessive` markers are relevant in German, since they formally require the absence of an article.
- In German, `number` is relevant as well; in Hungarian, on the other hand, `number` does not seem to have a great impact on the use of the article.
  (This difference cannot directly be explained by observed frequencies of certain combinations and would need to be addressed in more detail.)
- Other factors have less or no significant influence on the presence/choice of the article.

Factors determining the use of articles

How well do the random forest models predict the data?

Confusion matrix **German**

	Reference		
	def	indef	n
Prediction			
def	70	2	16
indef	12	53	11
n	19	0	112

Accuracy : 0.7966
No Information Rate : 0.4712

Confusion matrix **Hungarian**

	Reference		
	def	indef	n
Prediction			
def	114	6	22
indef	3	23	20
n	33	11	73

Accuracy : 0.7119
No Information Rate : 0.4712

Why look at those predictions?

- Results about the importance of factors are based on the models used.

→ Therefore, it is crucial to take into account to what extent the model used actually captures the data as it is observed.

- In this case, the models capture around 70% (Hungarian) to 80% (German) of the data, being clearly above the no information rate (the proportion of what is correctly predicted by allocating the observations to the three values randomly).

Marking givenness without articles

Demonstratives

Chinese and Russian can use a demonstrative in immediate anaphoric (but not deictic) contexts, where German, Hungarian, and English feature a definite article.

(3) *Who are **the** **people**?*

de *Wer sind **die** **Leute**?*
who are the people

hu *És kik **az** **emberek**?*
and who the people

zh ***zhe** **xie** **ren** shi shei?*
this CL people COP who

ru *Кто **эти** **люди**?*
who these people

Demonstratives

Chinese and Russian can use a demonstrative in immediate anaphoric (but not deictic) contexts, where German, Hungarian, and English feature a definite article.

(4)
*Well, down in **the** **dream**, Mal showing up.*

de
*Na ja, weil **im** **Traum** Mal aufgetaucht ist.*
well because in.the dream Mal show.up.PTCP is

hu
*Csak mert **álmodban** Mal megint jelen volt.*
only because dream.poss:2sg.in Mal again present was

ru
*Просто в **том** **сне** появилась Мол.*
simply in that dream showed.up Mal

Adnominal indefinites (Russian)

(from a different dataset)
In contexts where other languages (en, de, da, fr, sp, ro, hu) use an indefinite article, Russian marks the referent as not yet identifiable by an adnominal indefinite. Other languages without indefinite articles (mk, bg, ee, fi) simply feature a bare noun.

(5) *A boy! There's* ***a*** ***boy*** *in the water!*

de *Seht mal.* ***Ein*** ***Junge*** *ist im Wasser..*
da *Der er* ***en*** ***dreng*** *i vandet!*
fr ***Un*** ***garçon*** *!* ***Un*** ***garçon****, sur l'eau !*
sp *¡****Un*** ***niño****! ¡Hay* ***un*** ***niño*** *en el agua!*
ro ***Un*** ***băiețel****. E* ***un*** ***băiețel*** *în apă.*
hu ***Egy*** ***fiú*** *van a vízben!*
mk *Погледнете, момче!* ***Момче*** *во водата!*
bg *Вижте,* ***момче*** *във водата!*
ru *Там, в воде!* ***Какой-то*** *мальчик!*
ee *Vaata,* ***poiss****! Seal vees on* ***poiss****!*
fi *Vedessä on* ***poika****!*

The numeral *one* (Russian)

(from a different dataset)
Russian, amongst other languages without indefinite articles (mk, bg, ee, fi), use the numeral *one* to introduce a pragmatically specific referent.

(6) *I just heard about* ***this great place****.*

de *Ich weiß* ***einen ganz tollen Ort****.*
da *Jeg har lige hørt om* ***et skønt sted****.*
fr *J'ai entendu parler d'****un super endroit****.*
sp *Ven. Sé de* ***un lugar fantástico****.*
ro *Am auzit despre* ***un loc grozav****.*
hu *Tudok* ***egy állati jó helyet****.*
mk *Слушнав за* ***едно многу добро место****.*
bg *Току-що чух за* ***едно страхотно място****.*
ru *Пошли! Мне тут про* ***одно место*** *рассказали.*
ee *Tule, ma kuulsin* ***ühest põnevast kohast****.*
fi *Tule. Kuulin* ***yhdestä hienosta paikasta****.*

The numeral *one* (Chinese)

Chinese uses the numeral *one* much more frequently than Russian to express non-identifiability or non-specificity. In most instances, the referent is in object or predicate position.

The numeral *one* marking non-specificity:

(7) *Imagine you're designing* ***a*** ***building***.

de	*Sie*	*entwerfen*	***ein***	***Gebäude***.	
	you	design	a	building	
hu	*Tegyük fel,*	*tervezel*	***egy***	***házat***.	
	let's.assume	plan.2SG	a	house.ACC	
zh	*ni*	*sheji*	***yi***	***zuo***	***jianzhuwu*** *shi*
	you	plan	one	CL	building if
ru	*Представь,*	*что*	*ты*	*проектируешь*	***здание***.
	imagine.IMP	COMPL	you	plan	building

The numeral *one* (Chinese)

In this example, the numeral *one* has been omitted; however, the general classifier *ge* is stil present marking generic use:

(8) *You 're* ***a*** ***gift***.

de	*Du*	*bist*	***ein***	***Geschenk***.
	you	are	a	gift
hu	*Te*	***egy***	***ajándék***	*vagy*.
	you	a	gift	are
zh	*ni*	*shi*	***ge***	***liwu***
	you	COP	CL	gift
ru	*Потому*	*что*	*ты*	***дар***.
	because		you	gift

Word order

Discourse-old, i.e. given referents tend to occur sentence-initially.

(9)
	The	***storm***	*cannot*	*be*	*stopped.*
de	***Der***	***Sturm***	*kann*	*nicht*	*aufgehalten werden.*
	the.NOM	storm.NOM	can	NEG	stop.PTCP be.FUT
hu	***A***	***vihart***	*nem lehet*		*megállítani*.
	the	storm.ACC	NEG possible		stop
zh	***baofengyu***	*shi*	*wufa*		*zuzhi de*.
	storm		COP cannot		stop
ru	***Бурю***	*нельзя*	*остановить*.		
	storm.ACC	must.not	stop.INF		

Word order

Discourse-new, i.e. not given referents tend to occur sentence-finally.

(10) *That's where they should be. They have **a** **purpose**.*

de	*Sie*	*haben*	***einen***	***Zweck***.	
	they	have	a	purpose	
hu	***Célj***	***uk***	*van*.		
	goal.POSS:3PL	is			
zh	*tamen*	*zhi*	*you*	***yi***	***ge mudi***
	they	only	have	one CL	purpose
ru	*У*	*них*	*есть*	***цель***.	
	at	them	is	purpose	

Word order

In this examples, a pragmatically specific referent is introduced. English, German, and Hungarian use an indefinite article, but keep the referent in subject position and sentence initially.

In both Chinese and Russian, no marker is used. However, the referent appears sentence finally, in Russian also as subject.

(11)
A great flood *is coming.*

de
Eine große Flut *kommt*.
a great flood comes

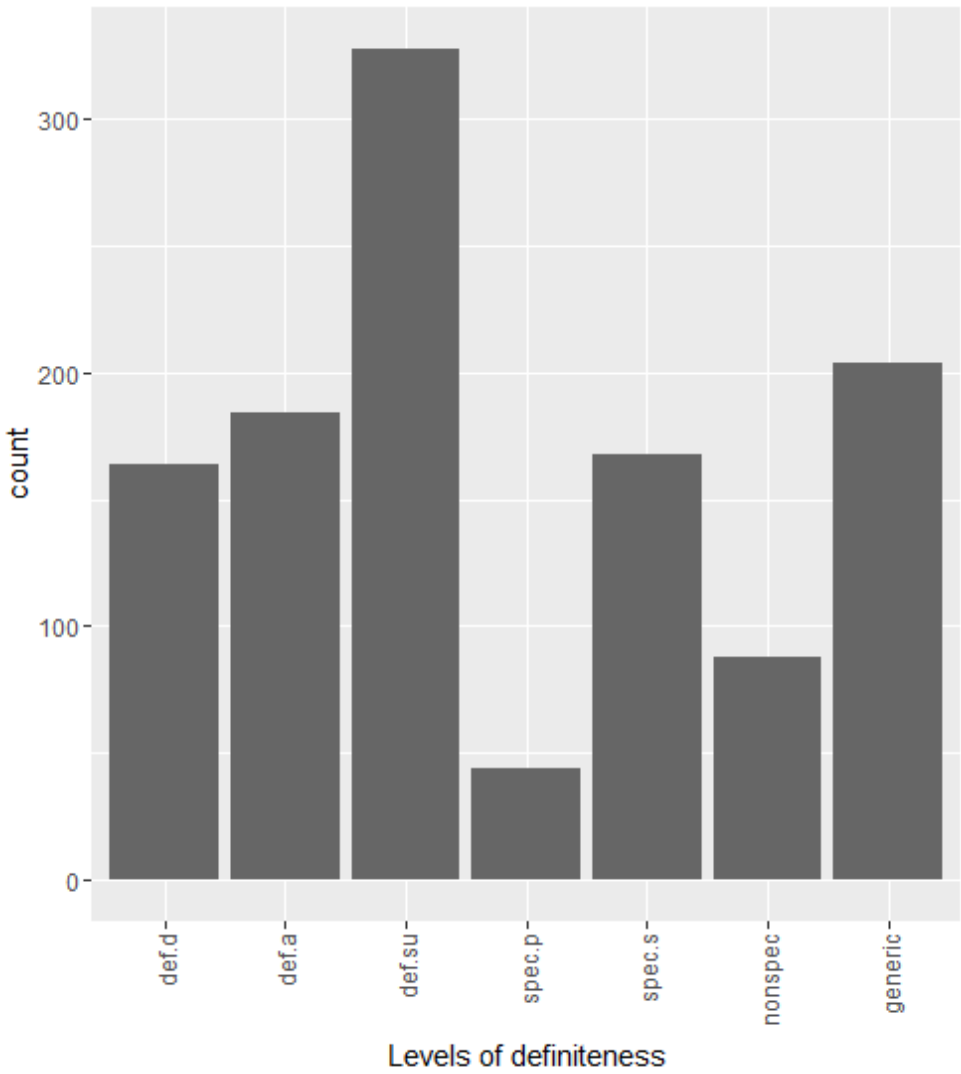
hu
Hatalmas vízözön *közeleg*.
great flood approaches

zh
daoshi hui you ***hongshui***
then fut have flood

ru
Близится ***Великий потоп****.*
approaches great flood

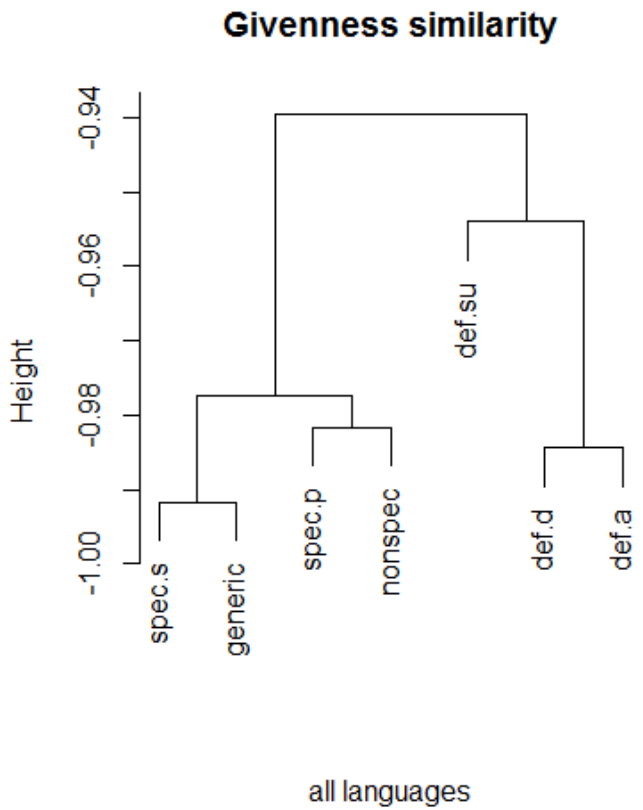
The levels of givenness

Counts of the givenness levels



Clustering the givenness levels

definite `def.d, def.a, def.su`
indefinite `spec.p, spec.s, generic, nonspec`

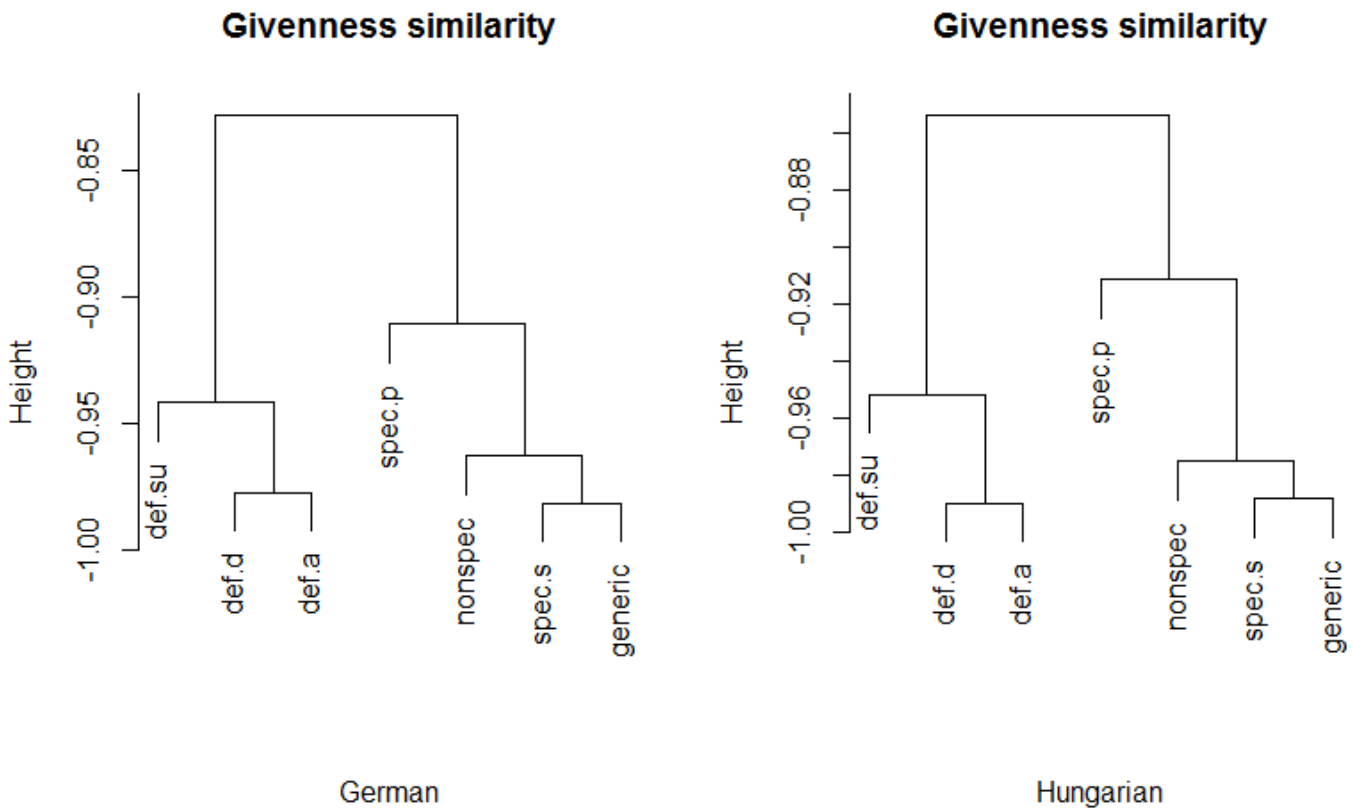


The distance of the levels is measured based on:

`synt.pos, article, possessive, classifier, demonstrative, adjective, other attribute, pronoun, number`

Clustering the givenness levels

definite def.d, def.a, def.su
indefinite spec.p, spec.s, generic, nonspec

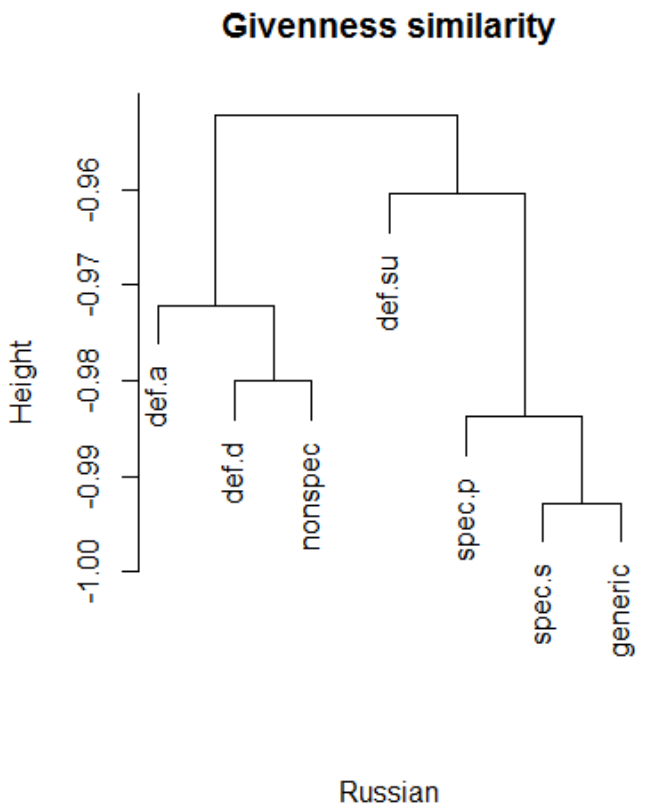


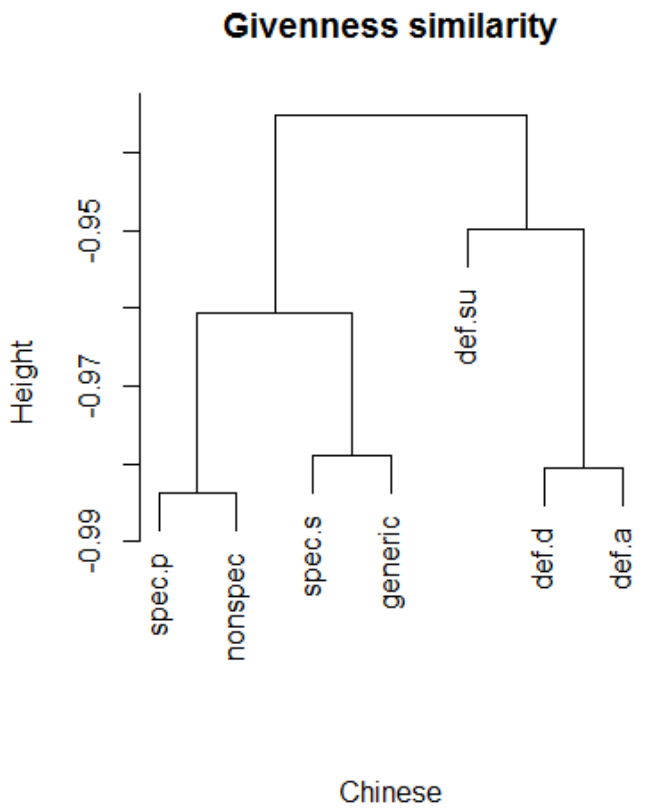
The distance of the statuses is measured based on:

synt.pos, article, possessive, classifier, demonstrative, adjective, other attribute, pronoun, number

Clustering the givenness levels

definite def.d, def.a, def.su
indefinite spec.p, spec.s, generic, nonspec





The distance of the statuses is measured based on:

synt.pos, article, possessive, classifier, demonstrative, adjective, other attribute, pronoun, number

Clustering the givenness levels

- Considering all 4 languages, definites and indefinites fall into two major clusters.
- This holds for the individual languages as well, except in Russian, where `non-specific` clusters with `anaphoric` and `deictic` definites, as well as `situational unique` definites with `specific` and `generic`.
- Situational unique definites consistently pattern less with anaphoric and deictic definites.

→ Instead two levels, three levels of definiteness could be distinguished:
indef, **def1** (`anaphoric, deictic`), **def2** (`situational unique`)

- The cluster of indefinites is less consistent. A larger data set might help to say more about that.

Relevant factors for definiteness

Relevant factors

A note on the levels of definiteness

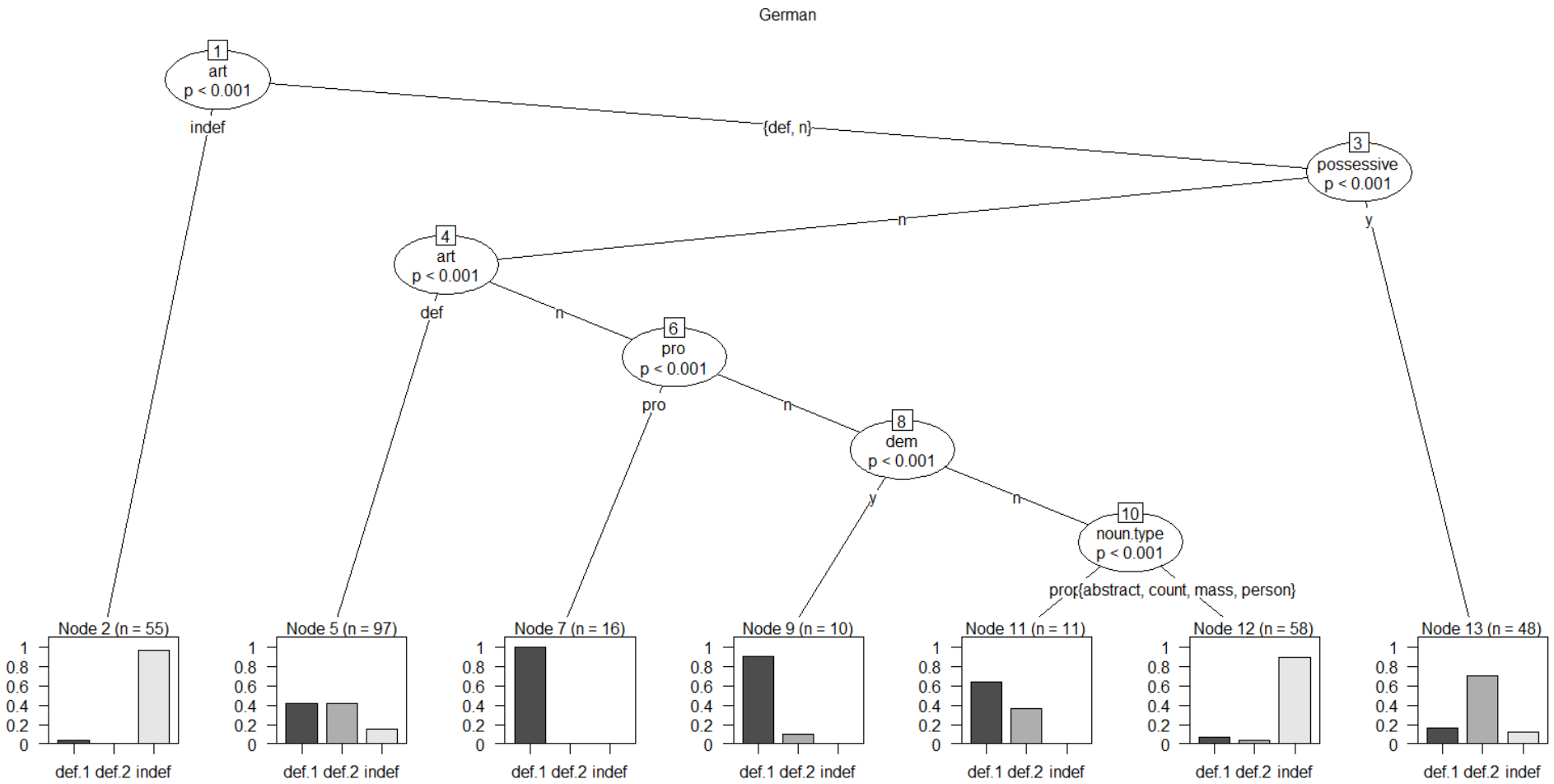
- As clustering has shown, the data from all 4 languages provides evidence for a split of the definite values into `anaphoric` and `deictic` on the one hand (`def1`), and `situational unique` on the other (`def2`).
- This distinction of three values for definiteness (`def1`, `def2`, `indef`) has been maintained for the analysis of relevant factors based on trees and forests.
- Having only two values for the variable tested gives a higher accuracy (the model only has to be able to predict one of two possible outcomes) than with three values.

→ Why not a two-way distinction of `def` vs. `indef`?

→ Although the model predicts better with only two values for definiteness (higher accuracy), it cannot capture the impact of factors that are relevant to distinguish between `def1` and `def2`. Considering these as separate values gives a more accurate picture of what is linguistically relevant to express definiteness.

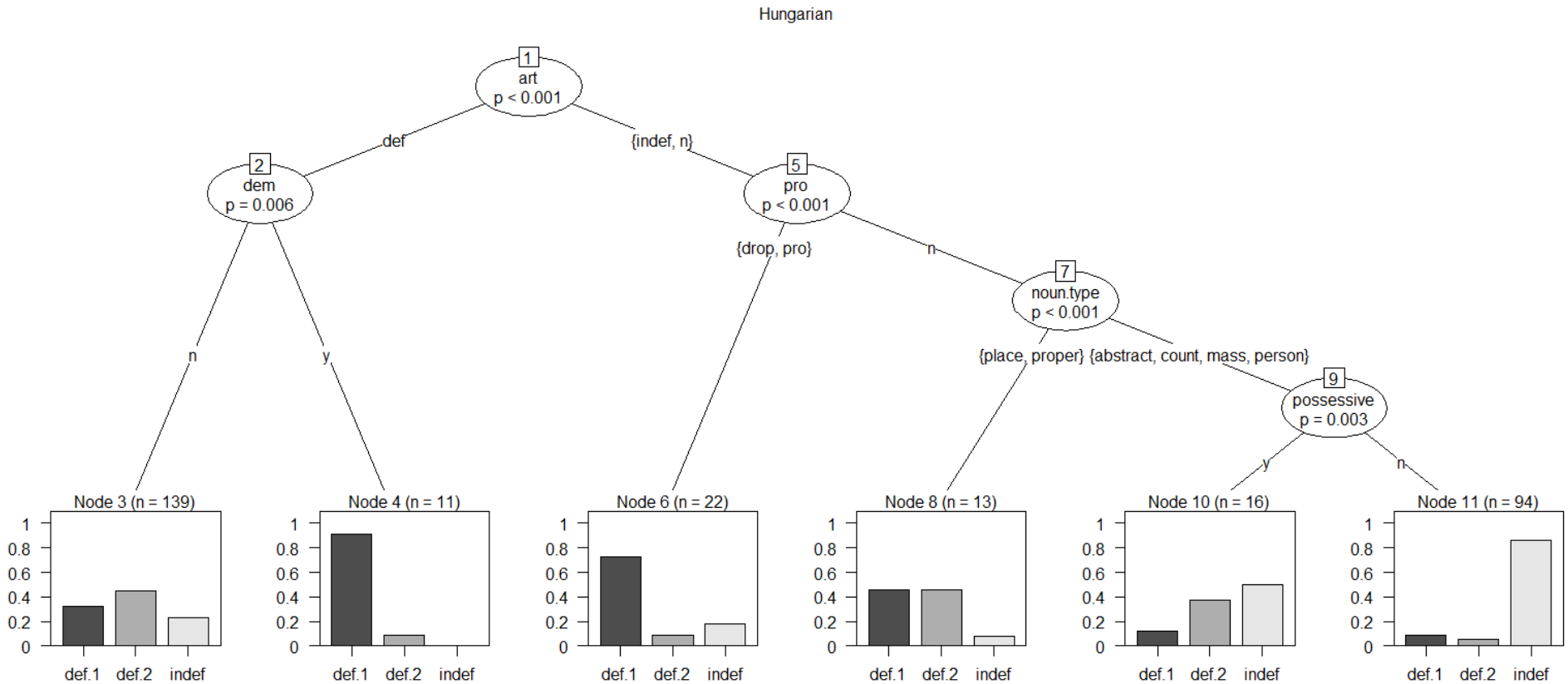
Relevant factors: conditional inference trees

German



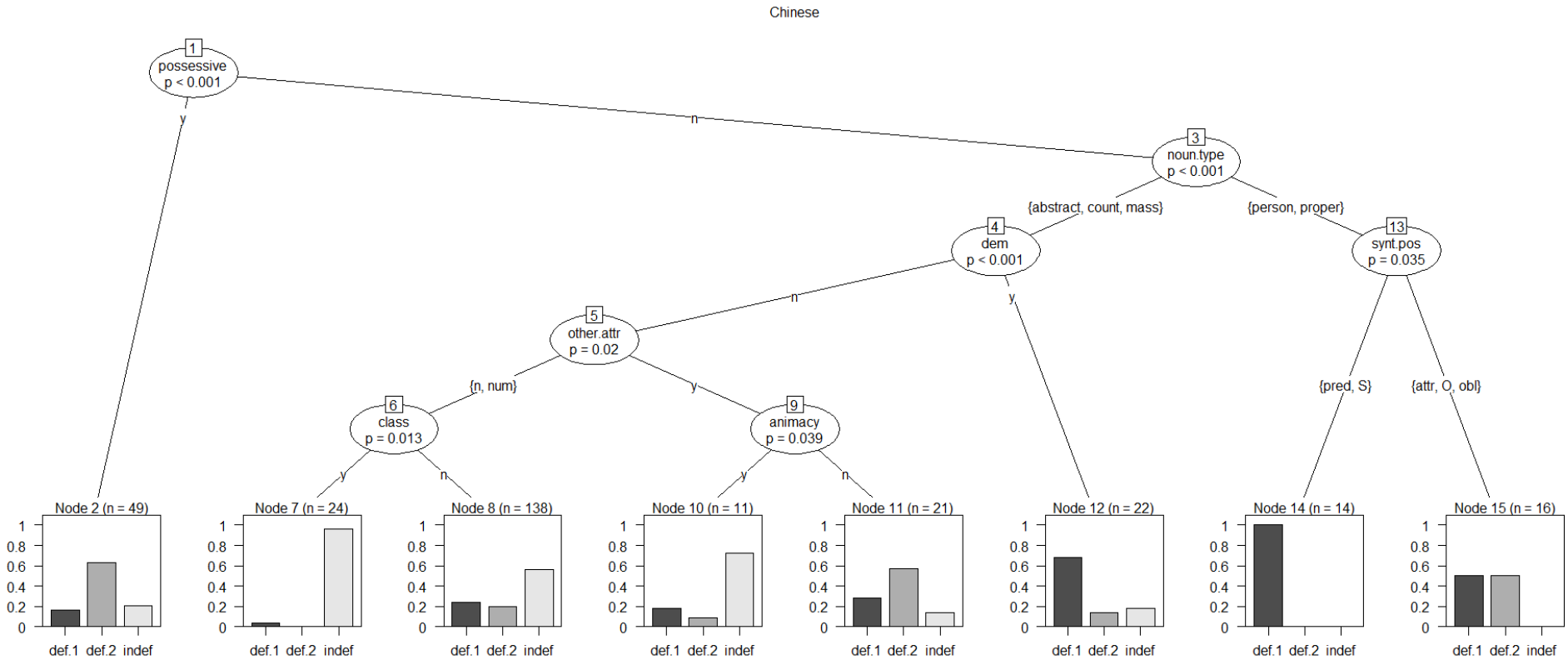
Relevant factors: conditional inference trees

Hungarian



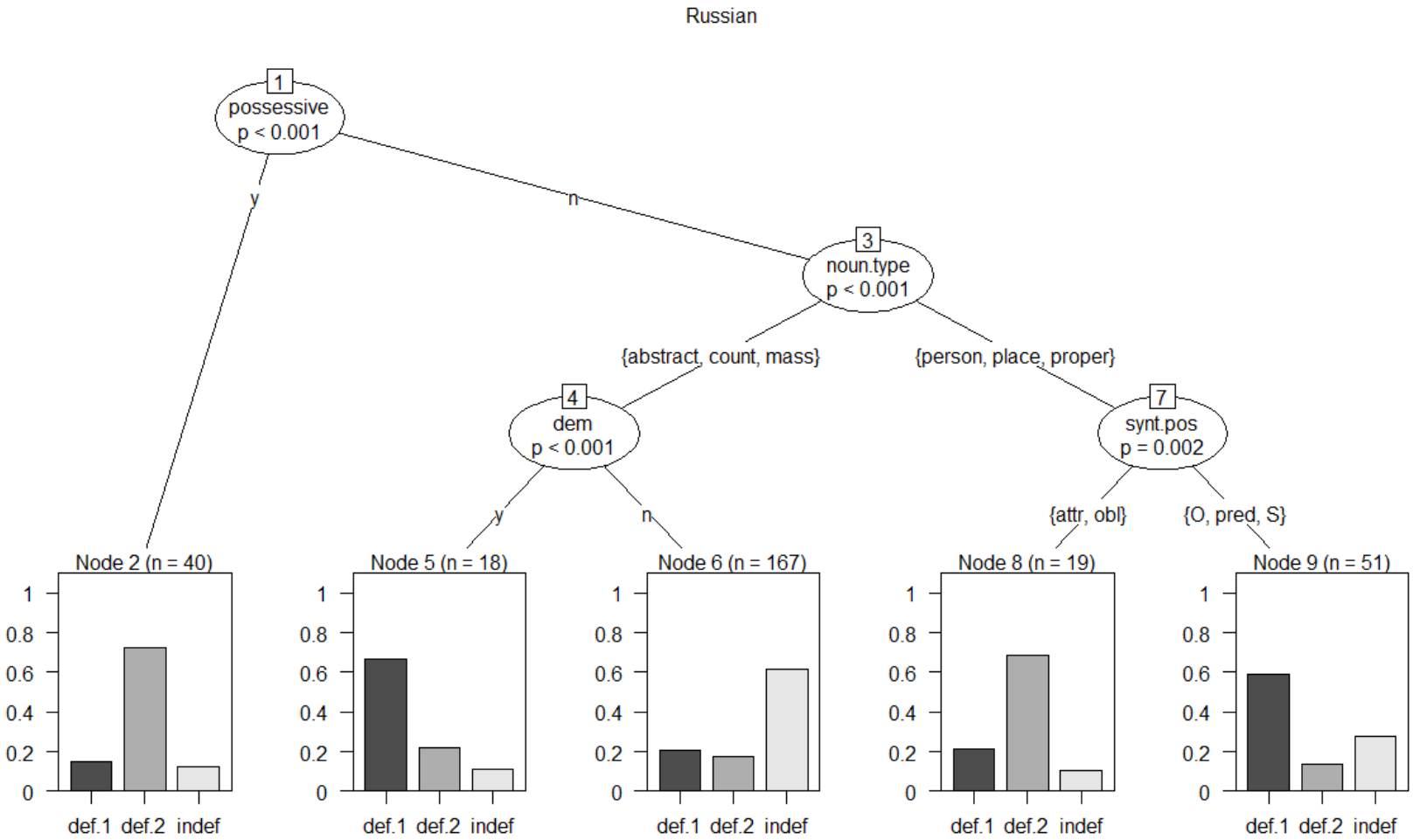
Relevant factors: conditional inference trees

Chinese



Relevant factors: conditional inference trees

Russian



Relevant factors: conditional inference trees

NB: Conditional inference trees provide rather a first approximation and a visualization of the interaction and strength of the factors tested for definiteness (for more reliable results, we will consider forests next).

German and Hungarian

- The `article` is the most influential factor for definiteness.
- The `semantic properties` of the noun are not very influential; only for a sub-part of the data, `proper nouns` and `places` are correlated with the `definite` and all other values with the `indefinite` values.
- The `syntactic position` is not relevant.

Chinese and Russian

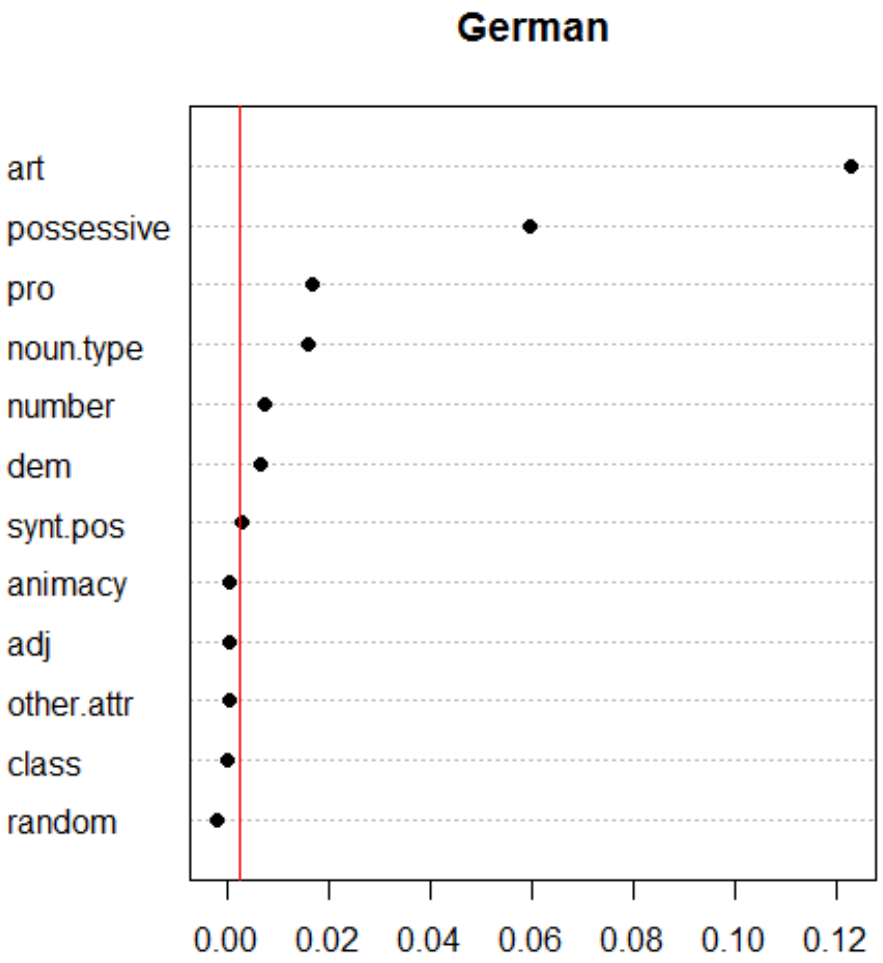
- The most relevant factors are `possessive` markers and the `semantic properties`.
- The `syntactic position` of the referent is relevant to definiteness for `persons`, `proper` nouns, and `place` names.

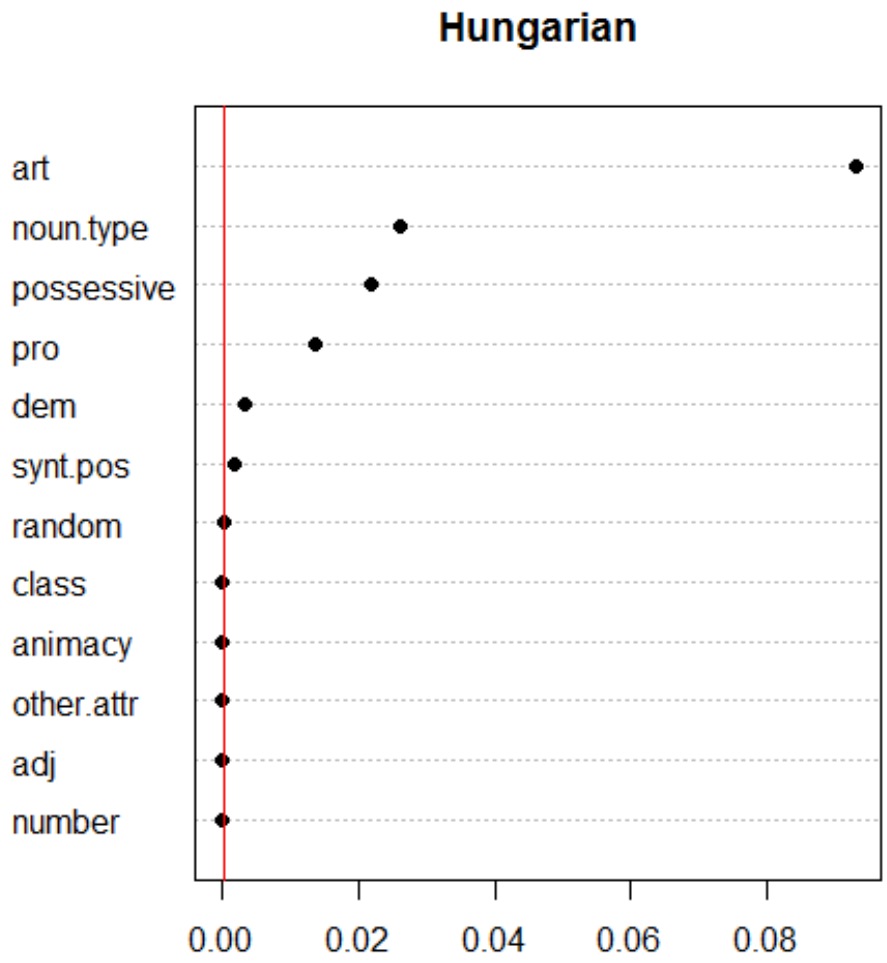
In all languages

- `Demonstratives` and `pronouns` are relevant for `def1`, while `possessives` often mark `def2`.

Relevant factors: random forests

Strength of the factors (conditional variable importance)





Relevant factors: random forests

How well do the models predict the data?

Confusion matrix **German**

Prediction	Reference def1	def2	indef
def1	50	21	12
def2	22	58	9
indef	15	3	105

Accuracy : 0.722
No Information Rate : 0.4271

compared to:
Accuracy with 2 levels of definiteness : 0.8949
Accuracy with 6 levels of definiteness : 0.4983

Confusion matrix **Hungarian**

Prediction	Reference def1	def2	indef
def1	60	22	14
def2	12	46	19
indef	15	14	93

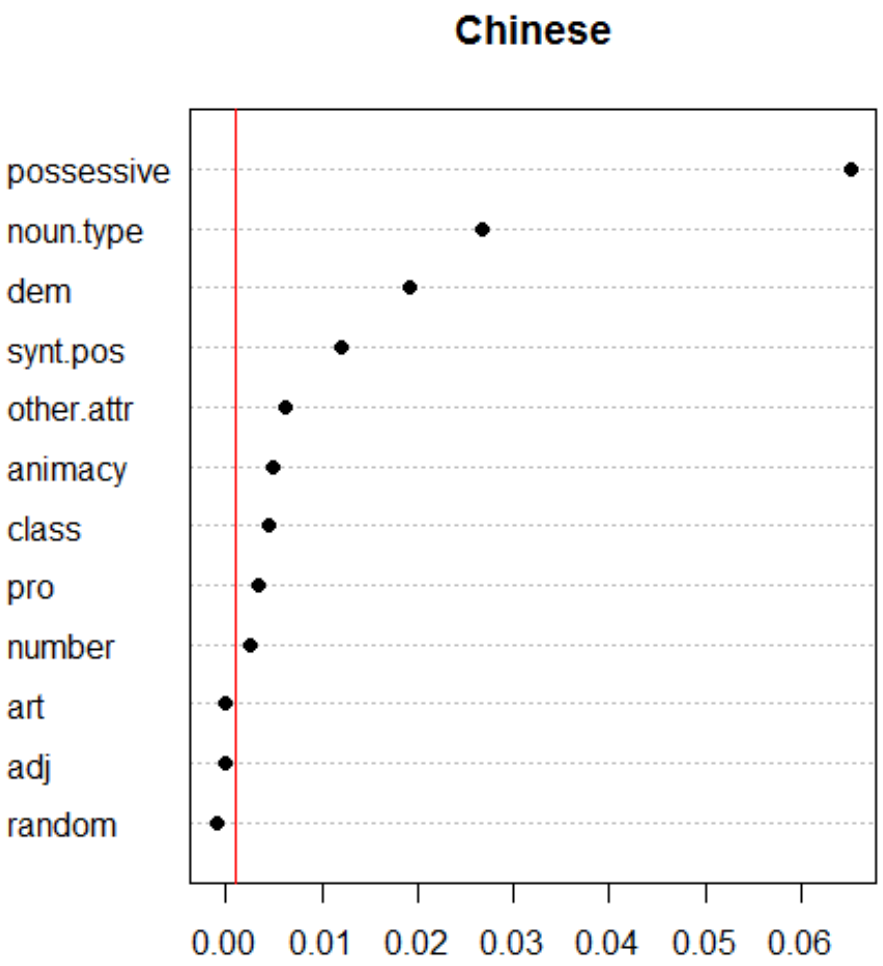
Accuracy : 0.6746
No Information Rate : 0.4271

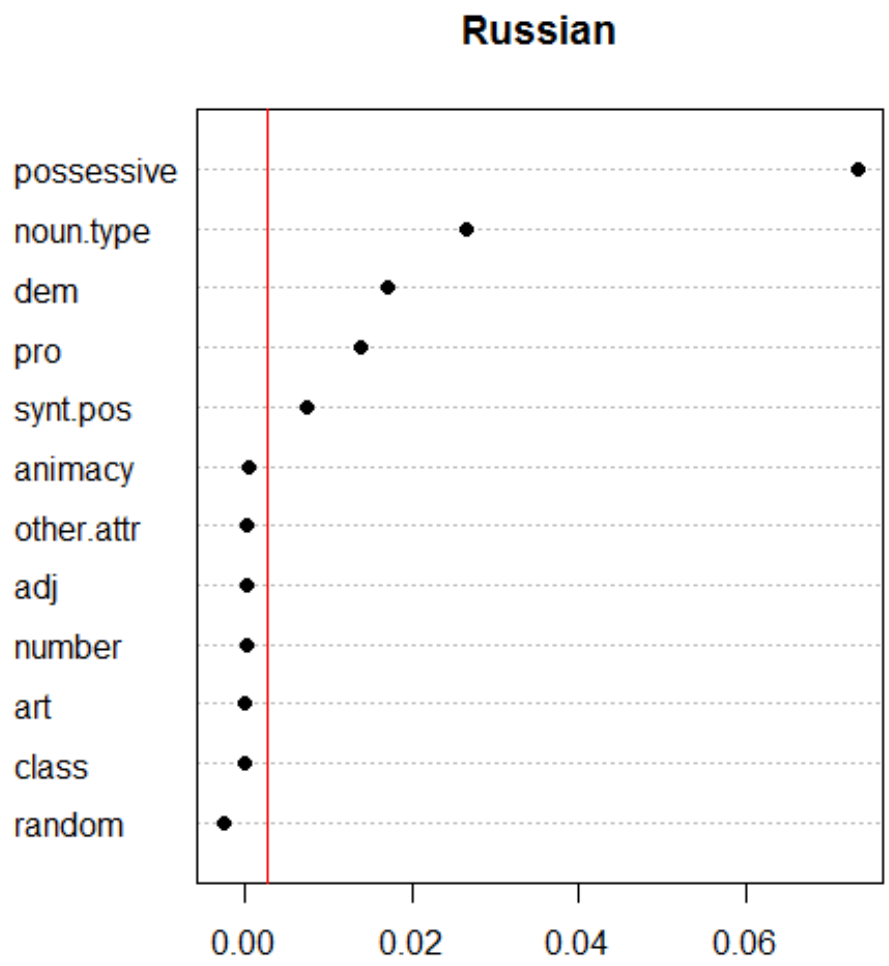
compared to:
Accuracy with 2 levels of definiteness : 0.8034
Accuracy with 6 levels of definiteness : 0.4373

- In both cases, accuracy is about 70%.
- In German, we find confusion mainly between def1 and def2, but below a random level.

Relevant factors: random forests

Strength of the factors (conditional variable importance)





Relevant factors: random forests

How well do the models predict the data?

Confusion matrix **Chinese**

Prediction	Reference def1	def2	indef
def1	37	11	4
def2	9	35	10
indef	41	36	112

Accuracy : 0.6237
No Information Rate : 0.4271

compared to:
Accuracy with 2 levels of definiteness : 0.7898
Accuracy with 6 levels of definiteness : 0.4678

Confusion matrix **Russian**

Prediction	Reference def1	def2	indef
def1	42	7	5
def2	8	40	7
indef	37	35	114

Accuracy : 0.6644
No Information Rate : 0.4271

compared to:
Accuracy with 2 levels of definiteness : 0.7356
Accuracy with 6 levels of definiteness : 0.4678

- In both cases, accuracy is above 60% and the no information rate.
- In contrast to what we found in German and Hungarian, in both Chinese and Russian, `indefinites` are confused with both `def1` and `def2`, while there is less confusion between the latter two values (at least in Russian)

Relevant factors: random forests

Summing up the strength of the factors

- Random forests largely support the impact of the factors seen in trees:
- The `article` is most relevant in both German and Hungarian.
- In Chinese and Russian, the most important clue wrt to definiteness comes from `possessive` marking, `semantics`, and `demonstratives`.
- In the two languages with articles, `demonstratives` play a less significant role.
- The `syntactic position` is not relevant in the two languages with articles, being significant in both Russian, and to a greater extent, in Chinese.
- `Pronouns` are relevant in all languages but Chinese (why this is the case needs further investigation).
- Also the presence of a `classifier` (as seen, e.g., in combination with a numeral) shows significant impact on the marking of definiteness in Chinese.
- Factors that do not show any influence on definiteness are: presence of an `adjective`, `other attributes` (except for Chinese).
- `Number` seems to have a statistically relevant impact in German and Chinese, but not in Russian and Hungarian.

Concluding remarks I

- This pilot study explored parallel texts for comparing the expression of givenness/definiteness across languages, including languages without articles.
- **+art** In both German and Hungarian, as expected, the article is the most important factor wrt the expression of givenness. The interaction and importance of other factors, however, differs, as well as the factors determining the use of articles. Using parallel texts, those two kinds of variation are made directly comparable.
- **–art** Although both Russian and Chinese have no articles, we saw differences in coding strategies for values of givenness, e.g. demonstratives, and the numeral *one*, a potentially emerging indefinite article in Chinese. While bare nouns tend to be interpreted as indefinite/non-specific in languages with articles, they seem to be rather definite by default in Russian, so that strategies of ”downgrading” (e.g. adnominal indefinites) are used in contexts of non-identifiability.

Concluding remarks II

- ±**art** While some properties set apart German and Hungarian from Chinese and Russian (e.g. the influence of demonstratives, syntactic position), other properties grouped German and Chinese (influence of number) or set apart Chinese from the rest (influence of pronominal use). This suggests that languages do not strictly fall into two clusters depending on the presence/absence of articles with respect to their encoding of givenness. To what extent languages pattern together into those two or other groups seems to be worth pursuing in further research using the approach presented here.
- **Levels of definiteness** Clustering the levels of givenness according to their encoding in the four languages revealed two major clusters (`def`, `indef`) in both languages with and without articles.
  Also, all languages showed a difference between anaphoric/deictic and non-anaphoric/deictic definites, motivating a three-way distinction of levels of definiteness.
  Including more languages will yield a more fine-grained picture of cross-linguistically relevant categories of givenness.

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Thank you!