One form, two meanings:

On the semantics of the specific and the generic masculine in German

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Masculine Generics in German

- in German, role nouns such as *Anwalt* 'lawyer' can be used as generic forms

word	referent gender(s)	grammatical gender	number
Anwalt	male	masculine	singular
Anwalt	male or female	masculine	
Anwältin	female	feminine	
Anwälte	male	masculine	plural
Anwälte	male and/or female	masculine	
Anwältinnen	female	feminine	

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- generic forms are not different from explicit masculine forms in their orthographic or phonological form
- they are used to describe individuals of all genders in singular and plural contexts
- generic forms are traditionally assumed to "abstract away" notions of gender; to be "gender-neutral" (Doleschal, 2002)

Previous Research

- however, previous research has cast doubt on the gender-neutral use of masculine generics
- most (if not all) behavioural studies on the subject find one overall result

  → masculine generics are not gender-neutral but show a clear bias towards the explicit masculine reading (e.g. Demarmels, 2017; Garnham et al., 2012; Gygax et al., 2008; Irmen & Kurovskaja, 2010; Irmen & Linner, 2005; Koch, 2021; Misersky et al., 2019; Stahlberg & Sczesny, 2001; Trutkowski, 2018)
- even though a masculine generic may be used by a speaker with the intention of considering all genders…
- …this intention is not fully translated by the receiver's comprehension system
- instead, a reading favouring male individuals is received

Research Question

Do masculine generics show a male bias or is the bias reported in previous research an artefact of behavioural methods?

analysis of semantic similarity via semantic vectors

Method: Target Items

- 113 target items were adapted from a study on the influence of stereotypical and grammatical information on the representation of gender in language (Gygax et al., 2008)
- all target items were role nouns

explicit masculine & generic masculine	translation
Anwalt	'lawyer'
Bäcker	'baker'
Dekan	'dean'
Historiker	'historian'
Maurer	'mason'
Professor	'professor'
Wärter	'guard'

Method: Target Items

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- all target items were role nouns
- all target items have a common explicit feminine form

explicit masculine & generic masculine	explicit feminine	translation
Anwalt	*Anwältin*	'lawyer'
Bäcker	*Bäckerin*	'baker'
Dekan	*Dekanin*	'dean'
Historiker	*Historikerin*	'historian'
Maurer	*Maurerin*	'mason'
Professor	*Professorin*	'professor'
Wärter	*Wärterin*	'guard'

Method: Corpus

- 10 million sentences were extracted Leipzig Corpora Collection's (Goldhahn et al., 2012) subcorpus "News" → 1 million for each year from 2010 to 2019
- from the 10 million sentences, the following was extracted:
  - 800,000 sentences without any target words
  - 30,000 sentences with target words
- the overall frequency for each target word in our corpus is relative to its overall frequency in the 10 million sentences sample, for example
  - a target with more than 20,000 occurrences is represented by 600 samples
  - a target with less than 200 occurrences is represented by 100 samples

Method: Annotation

- the 30,000 sentences containing target words were manually annotated by two authors and two assistants, all of which were native speakers of German
- for each target word occurrence, it was annotated whether the form was
  - masculine or feminine; singular or plural; explicit or generic
- the 800,000 sentences without and the 30,000 sentences with target words were then automatically analysed and annotated using the RNNTagger software (Schmid, 1999)
- tagged information consisted of words' base forms and information on inflectional grammar
- the manually compiled annotation and the automatic annotation were finally brought together for sentences with target words

Method: Distributional Semantics

- Distributional Hypothesis (Firth, 1957; Harris, 1954):

  difference in meaning ↔ difference in distribution

- Distributional Semantic Models:
  - meaning of a word = list of words which co-occur with the word
- difference in meaning is measured via semantic vectors
- one way to arrive at a word's semantic vector is Naïve Discriminative Learning (NDL)

  (Baayen & Ramscar, 2015)

Method: Naïve Discriminative Learning

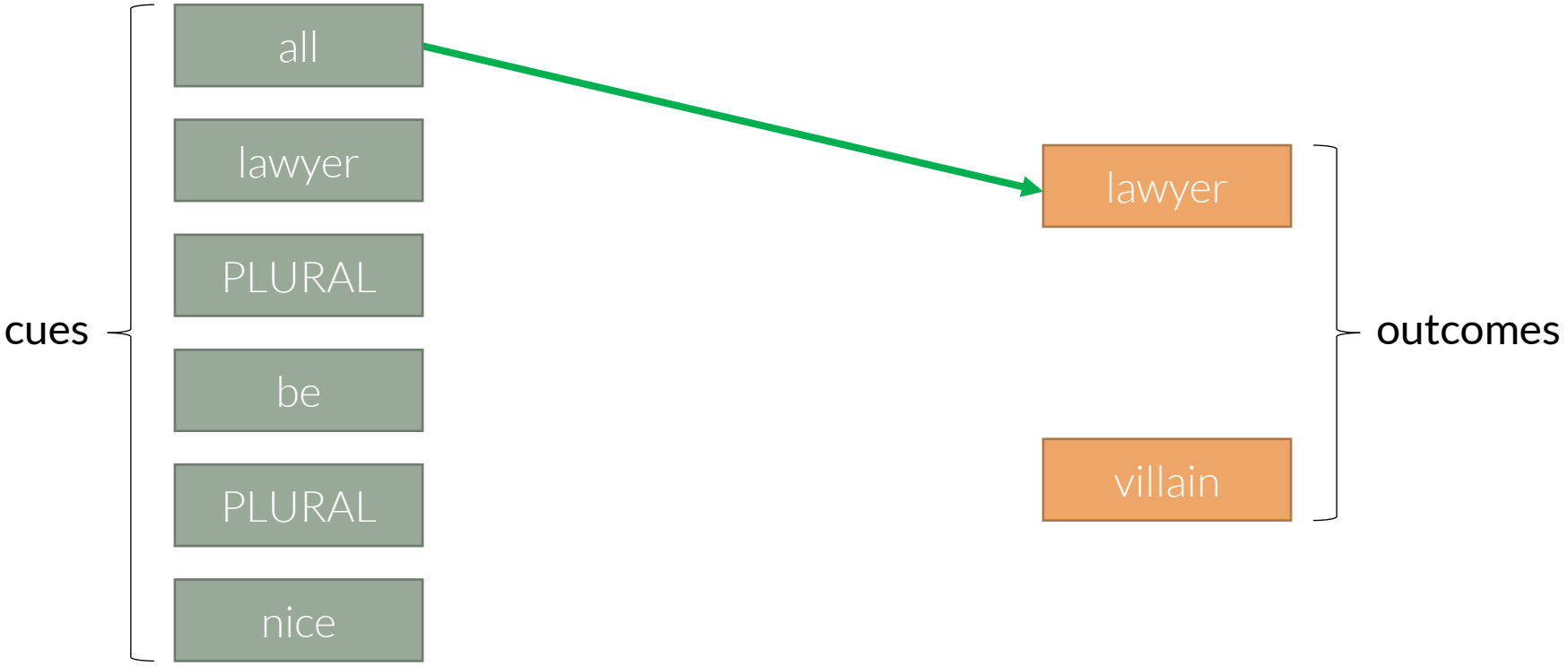
- taking the 830,000 annotated sentence corpus as a starting point, we computed semantic vectors for words and inflectional functions using NDL
- NDL follows the Rescorla-Wagner rules (Rescorla & Wagner, 1972; Wagner & Rescorla, 1972)
- most importantly, these rules state that
  - outcomes (word forms) are predicted by cues (words/inflection)
  - the associative strength between an outcome and a cue is represented by a single number
- we used each sentence to predict each individual word within the sentence by the other words in that sentence

Method: Naïve Discriminative Learning

Example: *All lawyers are nice.*

	all	lawyer	PLURAL	be	nice	villain	evil
lawyer							
villain							

Method: Naïve Discriminative Learning



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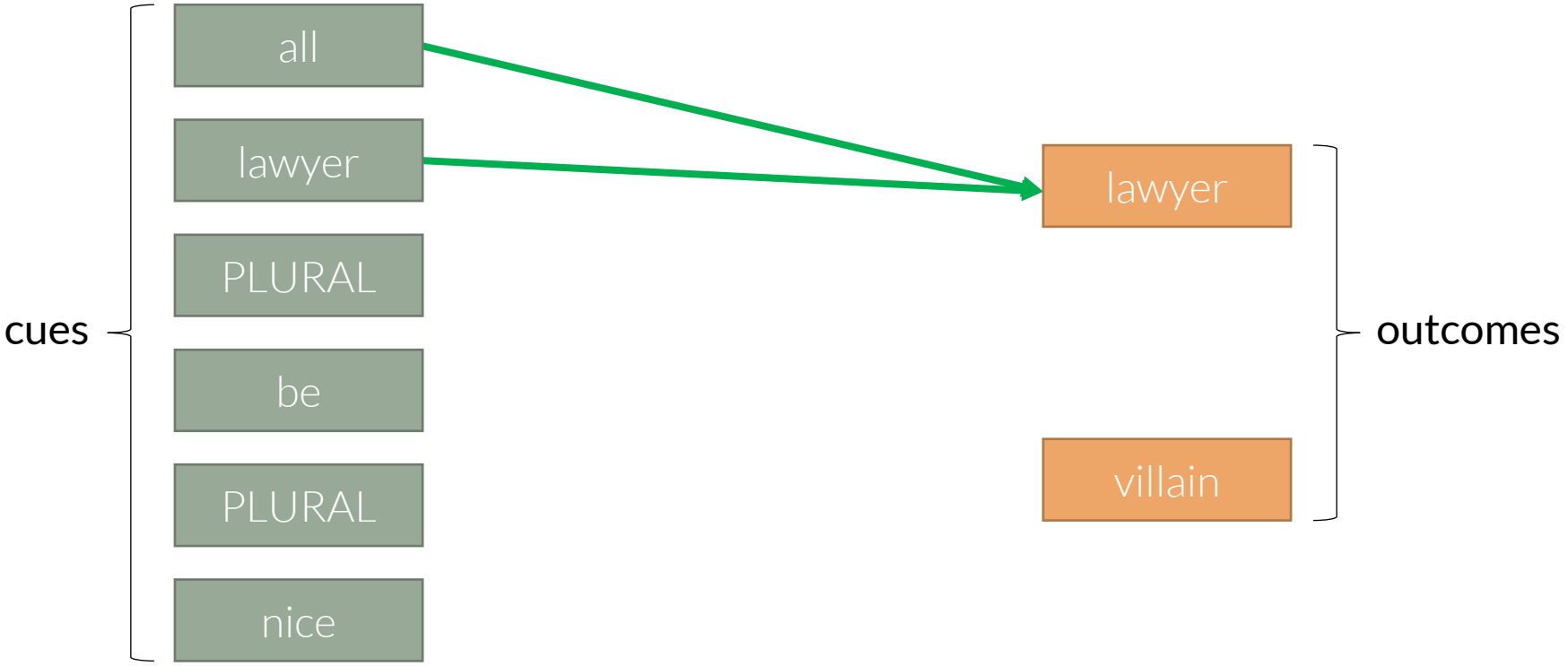

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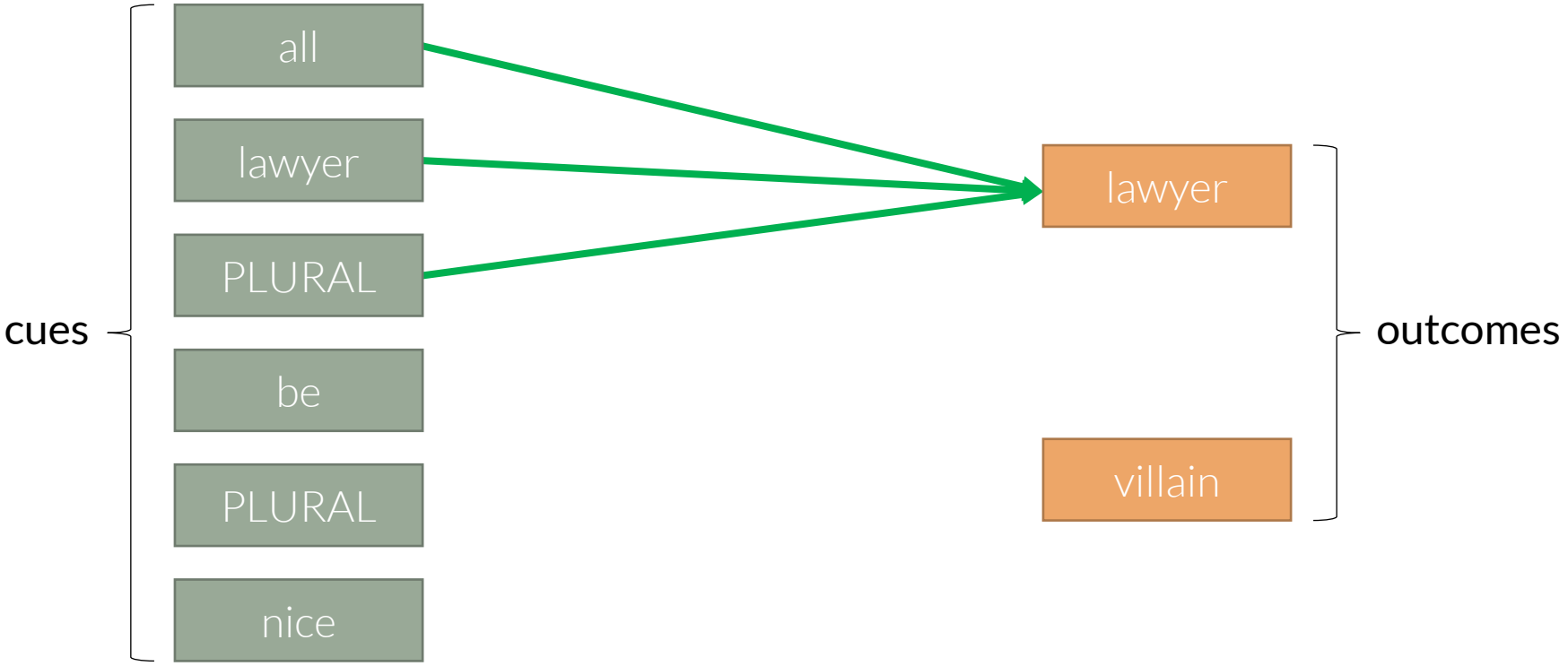

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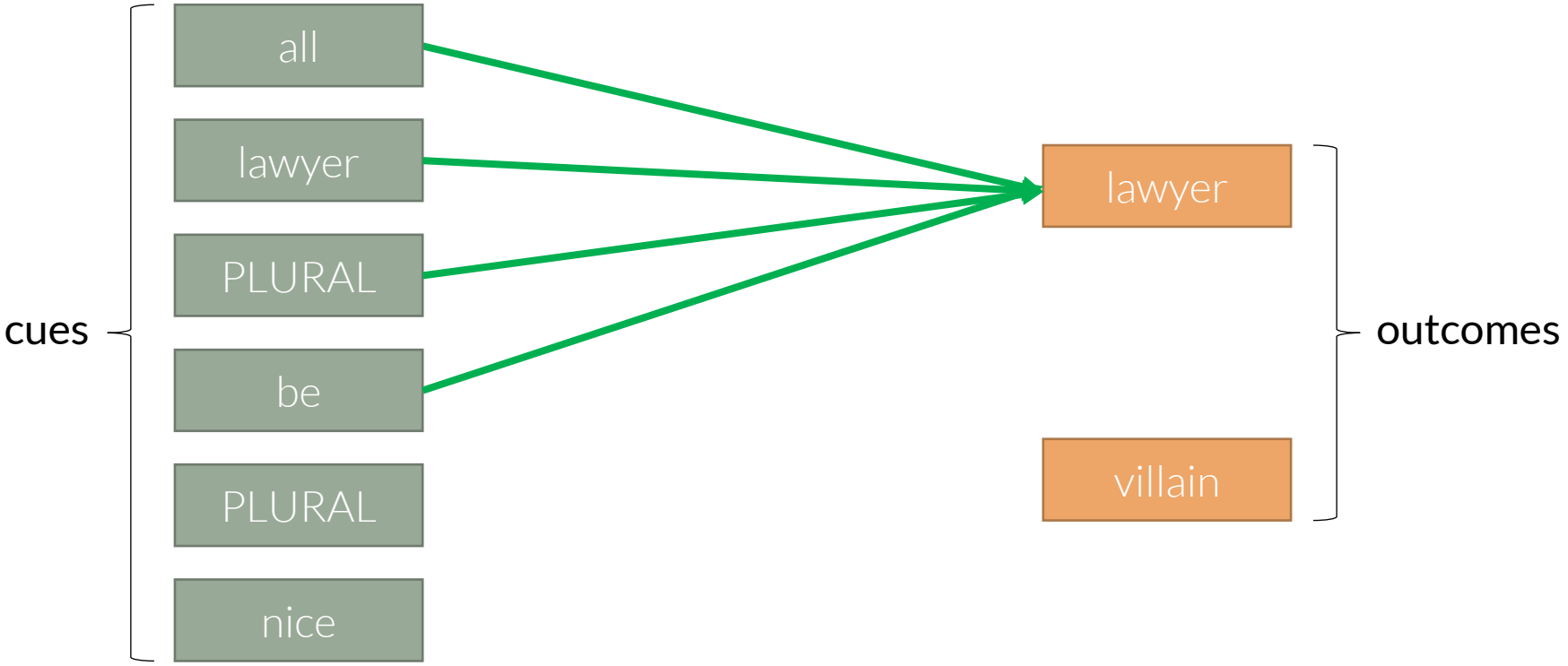

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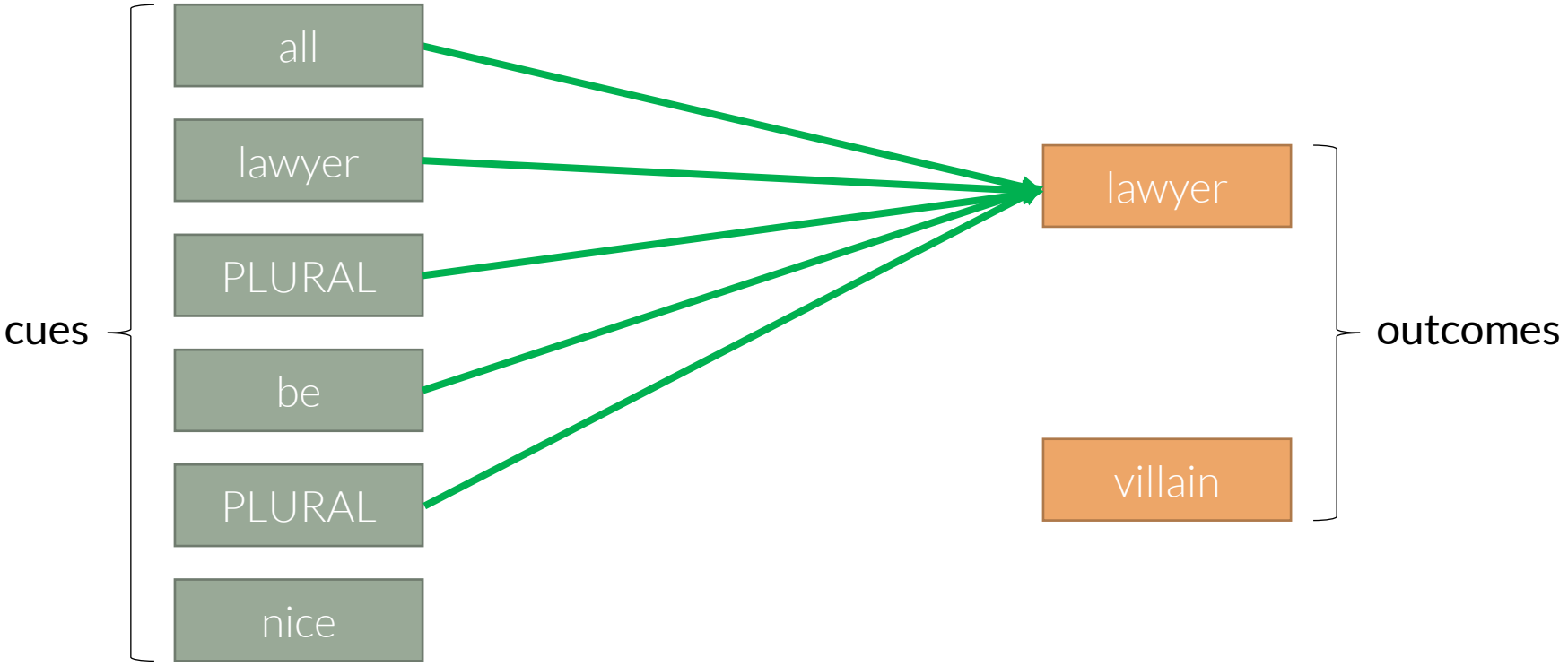

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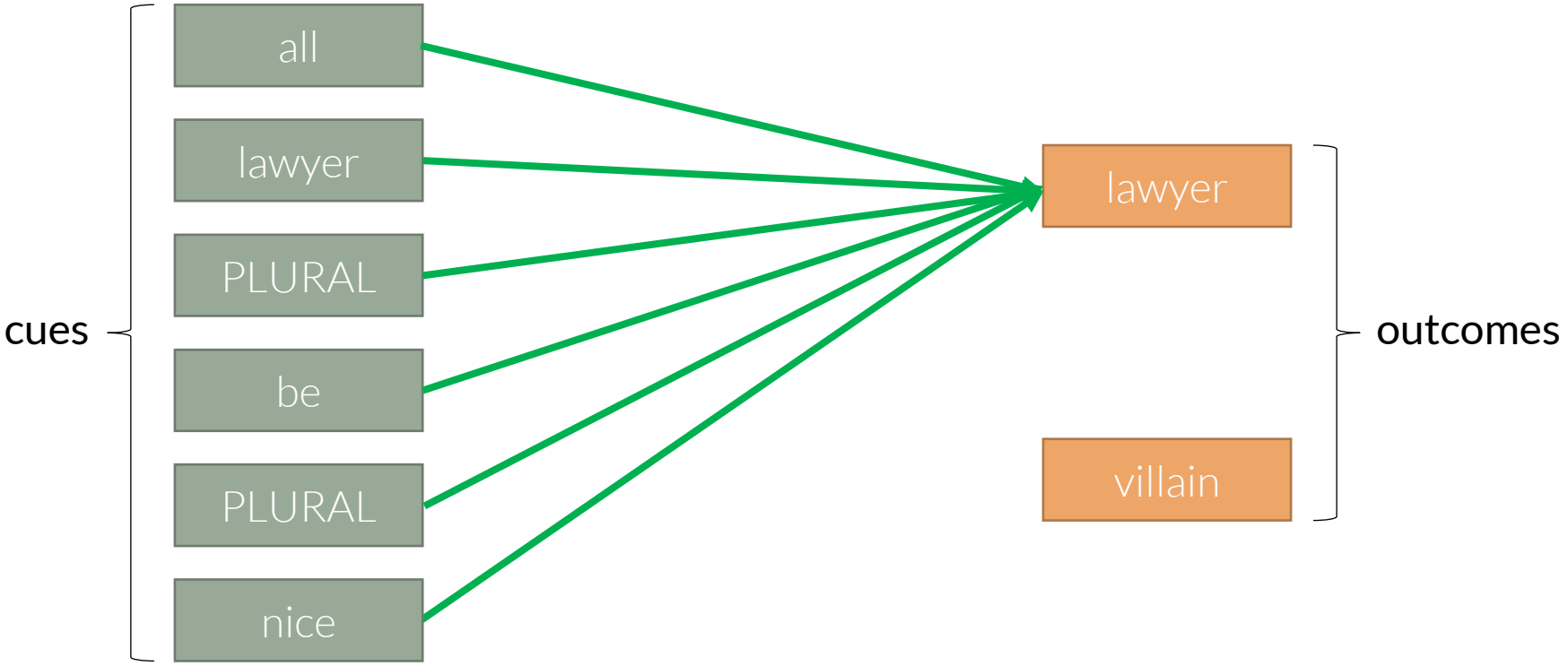

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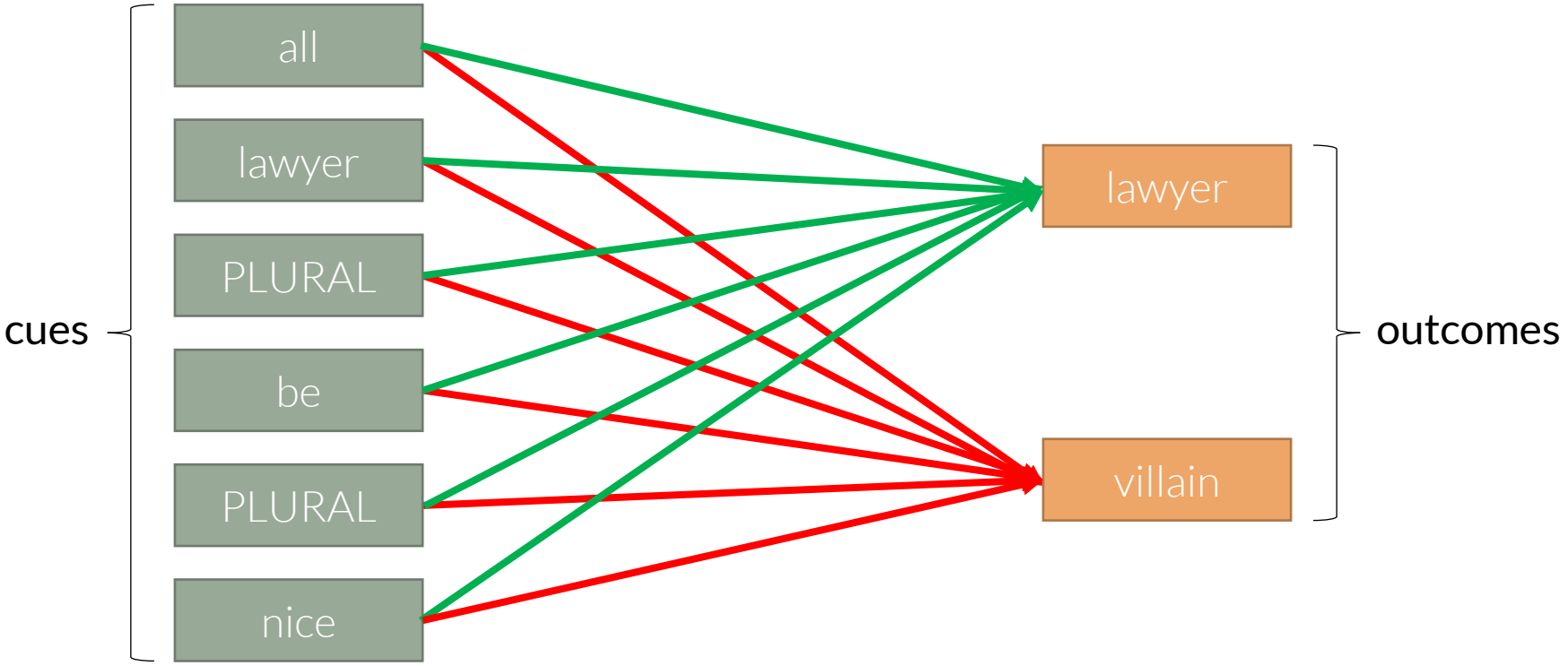

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lawyer	+	+	++	+	+	-	-
villain	-	-	--	-	-		

Method: Naïve Discriminative Learning

- repeating this procedure for 830,000 sentences, we obtained association weights for all target words, inflectional functions, and a huge number of other words
- taking these rows of association weights, we obtain semantic vectors of individual words and inflectional functions of length 7,500
- for example:

	Apfel 'apple'	trinken 'drink'	Gabel 'fork'	Kartoffel 'potato'	Universum 'universe'	Stern 'star'
essen 'eat'	0.3	0.2	0.5	0.4	0.00002	0.000071
Astronomie 'astronomy'	0.0003	0.0015	0.00704	0.0003	0.6	0.8

→ a word's associations with other words and inflectional functions describe the word's semantics

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- thus, for example, the semantics of the target word *Anwalt* 'lawyer' consists of

target form	base		number		gram. gender		type
Anwalt	Anwalt	+	singular	+	masculine	+	generic
Anwalt	Anwalt	+	singular	+	masculine	+	explicit
Anwältin	Anwalt	+	singular	+	feminine	+	explicit

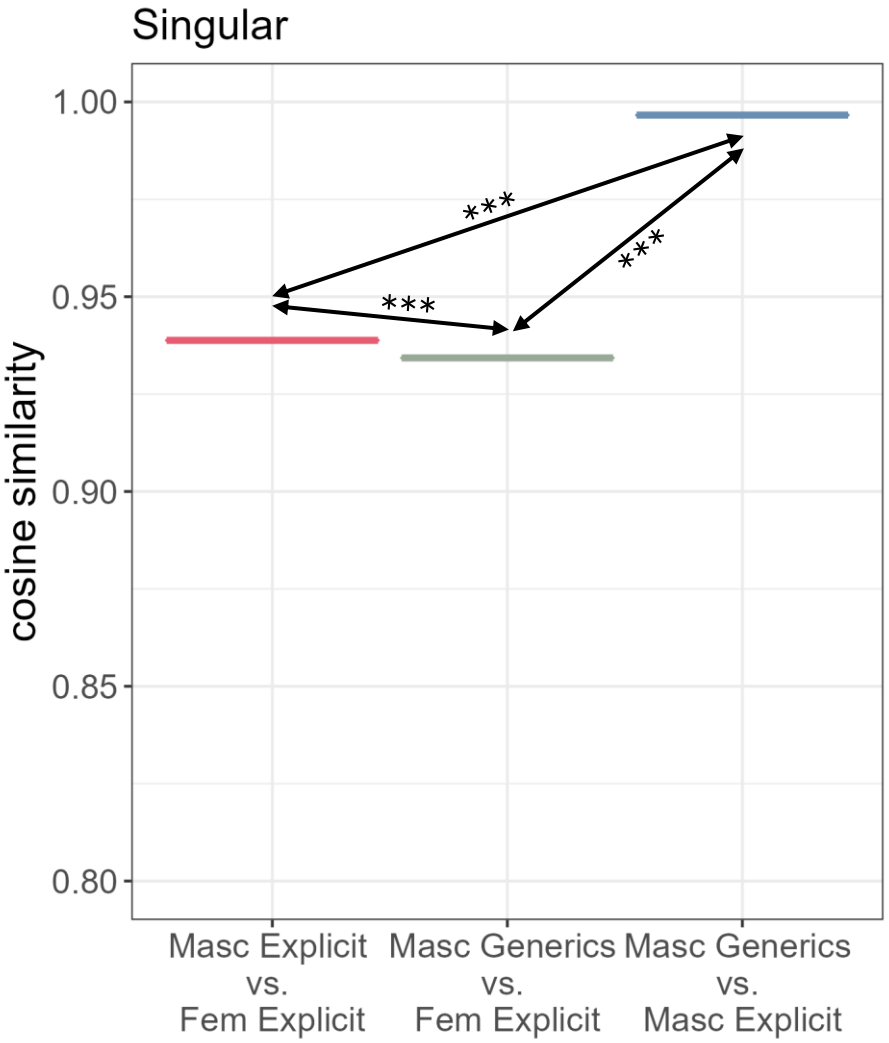
- accordingly, the plural forms are

word form	base		number		gram. gender		type
Anwälte	Anwalt	+	plural	+	masculine	+	generic
Anwälte	Anwalt	+	plural	+	masculine	+	explicit
Anwältinnen	Anwalt	+	plural	+	feminine	+	explicit

Analysis

- the resulting semantic vectors of masculine generics, explicit masculines, and explicit feminines can be compared by different statistical means
- we compared their similarity using cosine similarity
- in the present case, cosine similarity values can take values within the interval of $[0, 1]$
- for cosine similarity, a
  - higher value indicates a higher similarity of two vectors
  - lower value indicates a lower similarity of two vectors
- in our case: similarity of vectors reflects similarity of two words' semantics

Results



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- the **explicit feminine** is more similar to the explicit masculine than to masculine generics
- all comparisons are highly significant

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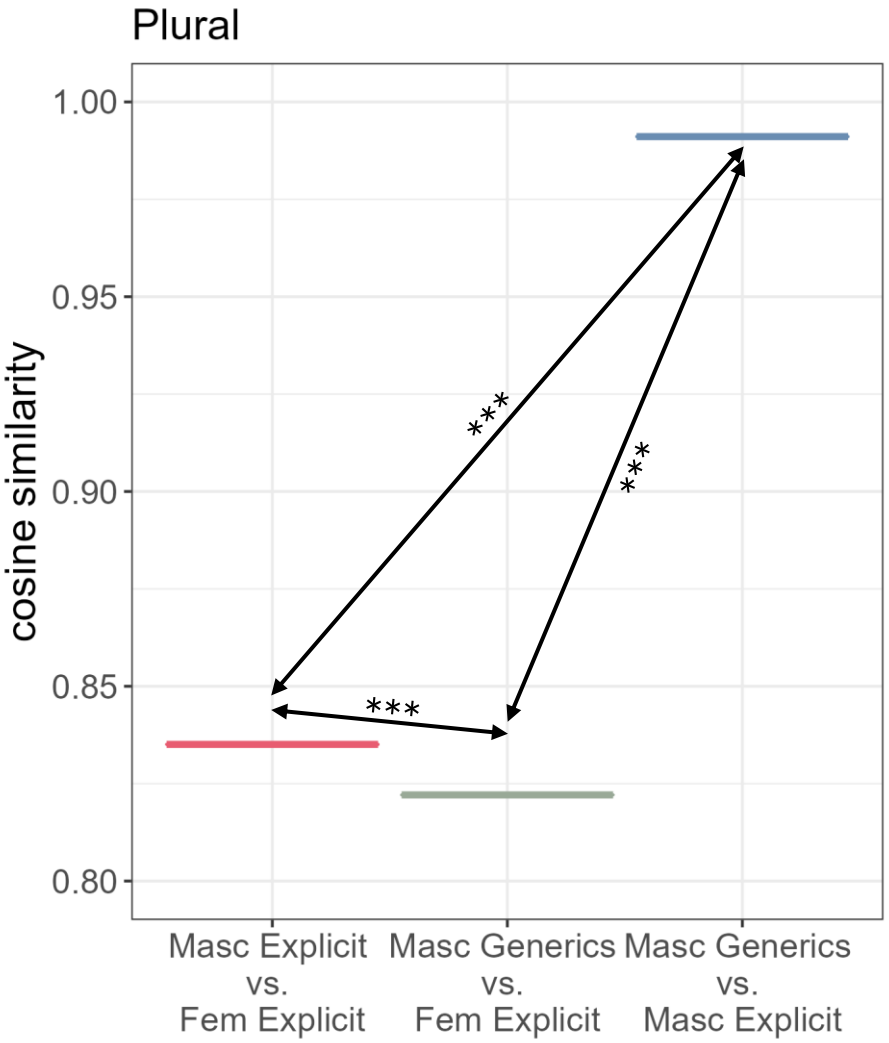

- masculine generics and the explicit masculine are semantically most similar
- the **explicit feminine** is more similar to the explicit masculine than to masculine generics
- all comparisons are highly significant
- differences are more pronounced

Discussion

Do masculine generics show a male bias or is the bias reported in previous research an artefact of behavioural methods?

→ masculine generics show a male bias

How can we explain the masculine generics male bias in terms of underlying representations in the mental lexicon?

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How can we explain the masculine generics male bias in terms of underlying representations in the mental lexicon?

- masculine generics associations with other lexicon entries are more similar to those of the explicit masculine than to those of the explicit feminine
- awareness of masculine bias in generic forms increases (cf. Kotthoff, 2020)
  - explanation for higher difference of generic masculine and explicit feminine
  - explanation for similarity of generic masculine and explicit masculine
  - explanation for similarity of explicit masculine and explicit feminine compared to generic masculine and explicit feminine

Conclusion

- masculine generics and the explicit masculine are semantically most similar
- the explicit feminine is more similar to the explicit masculine than to masculine generics
- masculine generics show a clear bias towards the masculine reading, producing a 'male bias' in the language system itself
- thus, our findings confirm the bias found in previous behavioural studies (e.g. Demarmels, 2017; Garnham et al., 2012; Gygax et al., 2008; Irmen & Kurovskaja, 2010; Irmen & Linner, 2005; Koch, 2021; Misersky et al., 2019; Stahlberg & Sczesny, 2001; Trutkowski, 2018)
- future research will show
  - what exact influence this bias has on comprehension and/or production
  - whether the cosine similarities found within our data are predictive of behavioural measures

Dankeschön!

‘Thank you!’

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