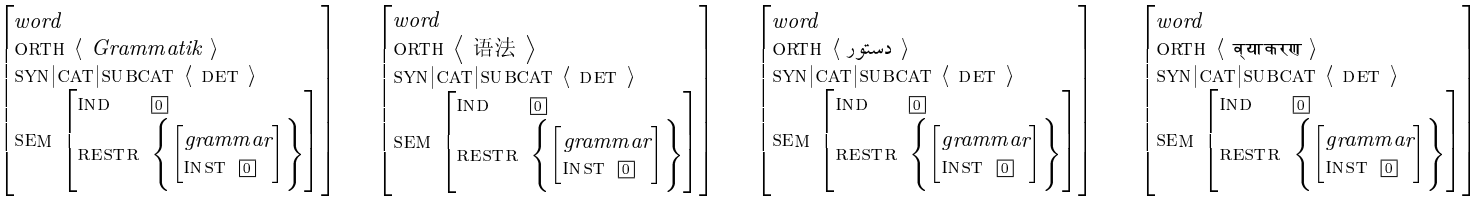


# An HPSG approach to German numeral classifiers

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31st Conference on Head-Driven Phrase Structure Grammar

July 10, 2024

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# Introduction

When it comes to numeral classifiers, people typically think of prototypical classifier languages, such as Chinese,

(Greenberg 1972; Aikhenvald 2000; Lehmann 2000)

- with differences between sortal classifiers (SCL) and measure (MCL) classifiers in (1).

(Cheng & Sybesma 1999; Li 2013; Her 2020 and a.o.)

(1) a. liang tou niu
two SCL cattle
'two heads of cattle"

b. liang pian mianbao
two slice.MCL bread
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(1) a. liang tou niu
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b. liang pian mianbao
two slice.MCL bread
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Sortal classifiers do not contribute additional lexical meaning, whereas MCL do.

# Introduction

Similar examples can also be found in German:

(2) a. zwei Stück$_{N1}$ Vieh$_{N2}$
two SCL cattle
'two heads of cattle'

b. zwei Scheibe-n$_{N1}$ Brot$_{N2}$
two slice.MCL-PL bread
'two slices of bread'

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Q: What is a numeral classifier?

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Q: What is a numeral classifier?
According to Aikhenvald (2000: 98) and Lehmann (2010: 249), a numeral classifier:

- combines a cardinal numeral (or a quantifier) and a counted nominal;
- is chosen predominantly based on semantics.

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According to Aikhenvald (2000: 98) and Lehmann (2010: 249), a numeral classifier:

- combines a cardinal numeral (or a quantifier) and a counted nominal;
- is chosen predominantly based on semantics.

→ German has numeral classifiers!

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# German numeral classifiers

A noun phrase consisting of three members:

- a numeral,
- a noun (N1) used as a unit of measurement or counting
- and another noun (N2) being measured or counted,

is known as a numerative construction (Numerativkonstruktion) in German.

(Löbel 1986; Gunkel et al. 2017)

(3) a. zwei Stück$_{N1}$ Vieh$_{N2}$
two SCL cattle
'two heads of cattle'

b. zwei Scheibe-n$_{N1}$ Brot$_{N2}$
two slice.MCL-PL bread
'two slices of bread'

# German numeral classifiers

Based on the semantic contribution of N1 they can be further divided into six subcategories: (Löbel 1986; Krifka 1989, 1991; Gunkel et al. 2017)

(4) a. **Measuring constructions** (Messkonstruktionen)
*zwei Liter Bier* 'two liters of beer'

b. **Container constructions** (Behälterkonstruktionen)
*zwei Flaschen Milch* 'two bottles of milk'

c. **Counting constructions** (Zählkonstruktionen)
*zwei Scheiben Brot* 'two slices of bread'

d. **Classifier constructions** (Klassifikatorkonstruktionen)
*zwei Stück Vieh* 'two heads of cattle'

e. **Collective constructions** (Kollektivkonstruktionen)
*zwei Hundertschaften Polizei* 'two hundred police'

f. **Kind constructions** (Sortenkonstruktionen)
*zwei Sorten Bier* 'two kinds of beer'

# German numeral classifiers

In this paper, I distinguish the so-called *classifier constructions* als SCL from other numerative constructions (MCL) for the following reasons:

- semantically: no additional lexical contribution
- morphologically: no morphological change
  → *zwei Stück Vieh* vs. *zwei Scheibe-n Brot*

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Arguably, the nouns *Stück* 'SCL' and *Scheibe* 'slice.MCL', both of which can be employed as classifiers, are located at different stages of grammaticalization.

Therefore, the following discussion will mainly revolve around *Stück* (SCL) and *Scheibe* 'slice' (as a representative of MCL).

# Nominal HEAD values

Undoubtedly, classifiers in German are nouns.

(5) a. das Stück Vieh
the SCL cattle
'the head of cattle'

b. die Scheibe Brot
the slice.MCL bread
'the slice of bread'

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Taking the count/mass distinction into account:

- mass nouns are not (directly) compatible with cardinal numerals,
- classifiers can be directly combined with numerals.

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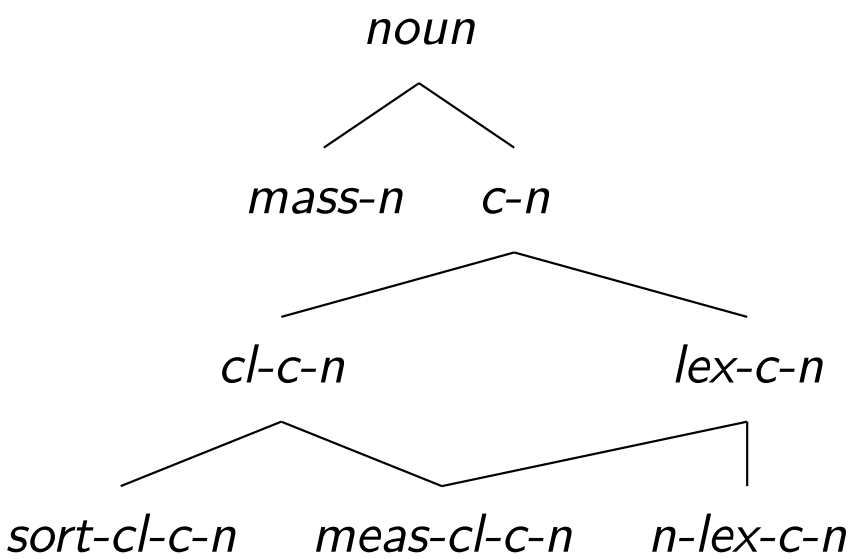
- mass nouns are not (directly) compatible with cardinal numerals,
- classifiers can be directly combined with numerals.

→ N2 is a mass noun, classifiers are count nouns.

# German numeral classifiers

(6) Hierarchy of nominal HEAD values




- Since the lexical meaning of MCL is more pronounced, any MCL i.e. a measure-classifier-noun is also a lexical count noun.
- Only *cl-c-n* can make *mass-n* occur in a numerative construction.

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# Combining N1 and N2

There are three possibilities for combining N1 and N2:

(7) a. mit zwei Scheibe-n köstlich-em Brot
with two slice.MCL-PL.DAT delicious-SG.DAT bread
'with two slices of delicious bread'

b. zwei Scheibe-n köstlich-en Brot-es
two slice.MCL-PL delicious-SG.GEN bread-SG.GEN
'two slices of delicious bread'

c. zwei Scheibe-n von diesem köstlich-en Brot
two slice.MCL-PL of this.DAT delicious-DAT.WK bread
' two slices of this delicious bread'

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c. zwei Scheibe-n von diesem köstlich-en Brot
two slice.MCL-PL of this.DAT delicious-DAT.WK bread
' two slices of this delicious bread'

In this paper, I follow Löbel (1986: 77-87), Krifka (1989: 15) and Kobele & Zimmermann (2012: 265), limiting myself to the juxtaposed structure with the same case (7a) that is more focused on the function of quantitative information.

# Headedness of a classifier phrase

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The case of *Scheibe* ‘slice.MCL’: N1 is the head
→ Subject-verb agreement

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→ Subject-verb agreement

(8) Auf dem Teller der Frau lieg-en zwei
one the.DAT plate the.GEN woman lie-PL two
kleingeschnitten-e Scheibe-n Brot
chopped-NOM.WK slice.MCL-PL bread.SG
‘On the woman’s plate are two slices of bread that have been cut into small pieces.’
(Braunschweiger Zeitung, 21.05.2010, DeReKo-example)

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The case of *Stück* ‘SCL’ :

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(9) 1955 kam-en 0,82 Stück Vieh auf einen Einwohner
1995 come.PST-PL 0.82 SCL cattle on one.AKK inhabitant
'In 1955, there were 0.82 head of cattle per inhabitant.'
(St. Galler Tagblatt, 24.01.1998, DeReKo-example)

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N1 can be the head
→ The NUM value of *Stück* 'CL' can be underspecified.

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N1 can be the head
→ The NUM value of *Stück* 'CL' can be underspecified.

N2 can not be the head.

- N2 is a mass noun → Mass nouns can take numerals?

In this case: **N1 is the head**.
→ *cl-c-c* is a subtype of count nouns, so *Stück* 'SCL' can be the head of the NP and all is safe.

# A semantic problem

Since N1 is the head of the noun phrase:

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Since N1 is the head of the noun phrase:

(10) a. ein tot-es Stück Vieh
one dead-ST.NOW/AKK.NEU SCL cattle
'a head of dead cattle'
(Neue Zürcher Zeitung, 29.05.2004, DeReKo-example)

b. ein-em krank-en Stück Vieh
one-DAT.NEU sick-WK.DAT SCL cattle
'a head of sick cattle.'
(die tageszeitung, 02.10.2009, DeReKo-example)

# A semantic problem

(11) a. CONT of *Stück*

$$\begin{bmatrix} \text{CONT} \begin{bmatrix} \text{IND} & \boxed{1} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{stück-rel} \\ \text{ARG} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

b. CONT of *Scheibe*

$$\begin{bmatrix} \text{CONT} \begin{bmatrix} \text{IND} & \boxed{1} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{scheibe-rel} \\ \text{ARG0} & \boxed{1} \\ \text{ARG1} & \boxed{2} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

A similar method of index inheritance can be found in Bender & Siegel (2004) and Levine (2010).

# Headedness of a classifier phrase

Please note that the adjectives modifying SCL and N2 have different meaning, as in (12).

(12) a. ein groß-es Stück Schokolade
one big-NEU.ST.SG SCL chocolate
'a large piece of chocolate'

b. ein süß-es Stück Schokolade
one sweet-NEU.ST.SG SCL chocolate
'a sweet piece of chocolate'

In (12b) it is still about a counting-*Stück*, whereas *Stück* in (12a) is partitive, hence (12a) will not be discussed in this paper.

# Headedness of a classifier phrase

(13) Lexical entry for *Stück* 'SCL' (preliminary version without Num and Det)

$$\begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{CONC} & \begin{bmatrix} \text{CASE} & \boxed{3} \end{bmatrix} \\ \textit{sort-cl-c-n} & \end{bmatrix} \\ \text{COMPS} & \left\langle \text{NP} \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{CONC} & \begin{bmatrix} \text{CASE} & \boxed{3} \end{bmatrix} \\ \textit{m-n} & \end{bmatrix} \\ \text{IND} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{IND} & \boxed{1} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{stück} & \\ \text{ARG} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

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# Case 1: when Num is other than one

Continuing from the preceding conclusion: CL is the head of the NP (14).

(14) zwei Stück$_{N1}$ Vieh$_{N2}$
two SCL cattle
'two heads of cattle'

In typical classifier languages, numerals are usually treated as a specifier or complement of the head classifier. (Bender & Siegel 2004; Ng 1997)

# Case 1: when Num is other than one

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In case of a definte article or a demenstrative in German:

- Two specifiers may be needed.
- A fixed order of Det-Num-CL is predicted.

# Case 1: when Num is other than one

But when a modifier is present, numerals and adjectives can be ordered freely:

(15) a. diese zwei trocken-en Scheibe-n Brot
these two dry-WK.PL slice.MCL-PL bread
'these two dry slices of bread'

b. diese trocken-en zwei Scheibe-n Brot
these dry-WK.PL two slice.MCL-PL bread
'these two dry slices of bread'

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'these two dry slices of bread'

b. diese trocken-en zwei Scheibe-n Brot
these dry-WK.PL two slice.MCL-PL bread
'these two dry slices of bread'

Considering that a numeral may not appear within a classifier phrase:

(16) diese kleinen Scheibe-n Brot
these small slice.MCL-PL bread
'these small slices of bread'

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But when a modifier is present, numerals and adjectives can be ordered freely:

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'these two dry slices of bread'

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'these two dry slices of bread'

Considering that a numeral may not appear within a classifier phrase:

(16) diese kleinen Scheibe-n Brot
these small slice.MCL-PL bread
'these small slices of bread'

It is reasonable to treat the Num as a modifier,
→ an indeclinable adjective as in *ein lila Kleid* 'one purple dress'

# Case 1: when Num is other than one

Without a definite article or demonstrative:

# Case 1: when Num is other than one

Without a definite article or demonstrative:
Numerals can only be placed on the leftmost side of the classifier phrase.

(17) a. zwei klein-e Scheibe-n Brot
two small-ST.PL slice.MCL-PL bread
'two small slices of bread'

b. * kleinen zwei Scheibe-n Brot
small-ST.PL two slice.MCL-PL bread
Int: 'two small slices of bread'

→ In the absence of a definite determiner, the Num seems to take over the function of a specifier in the classifier phrase

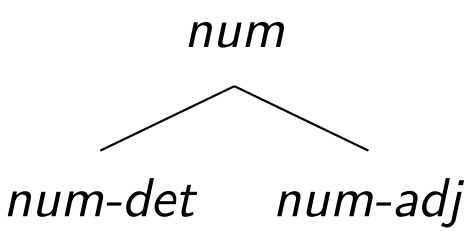
# Case 1: when Num is other than one

The analysis on numerals should fulfill both (15) and (17):

- A numeral is a modifier if there is a specifier within a classifier phrase;
- The numeral will be the specifier if no other specifier is present.

**Solution**: the HEAD value of Num is an underspecified sort *num* with two subtypes.

(18) Hierarchy of numeral HEAD values



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In German, classifiers need necessarily a specifier, not a numeral.

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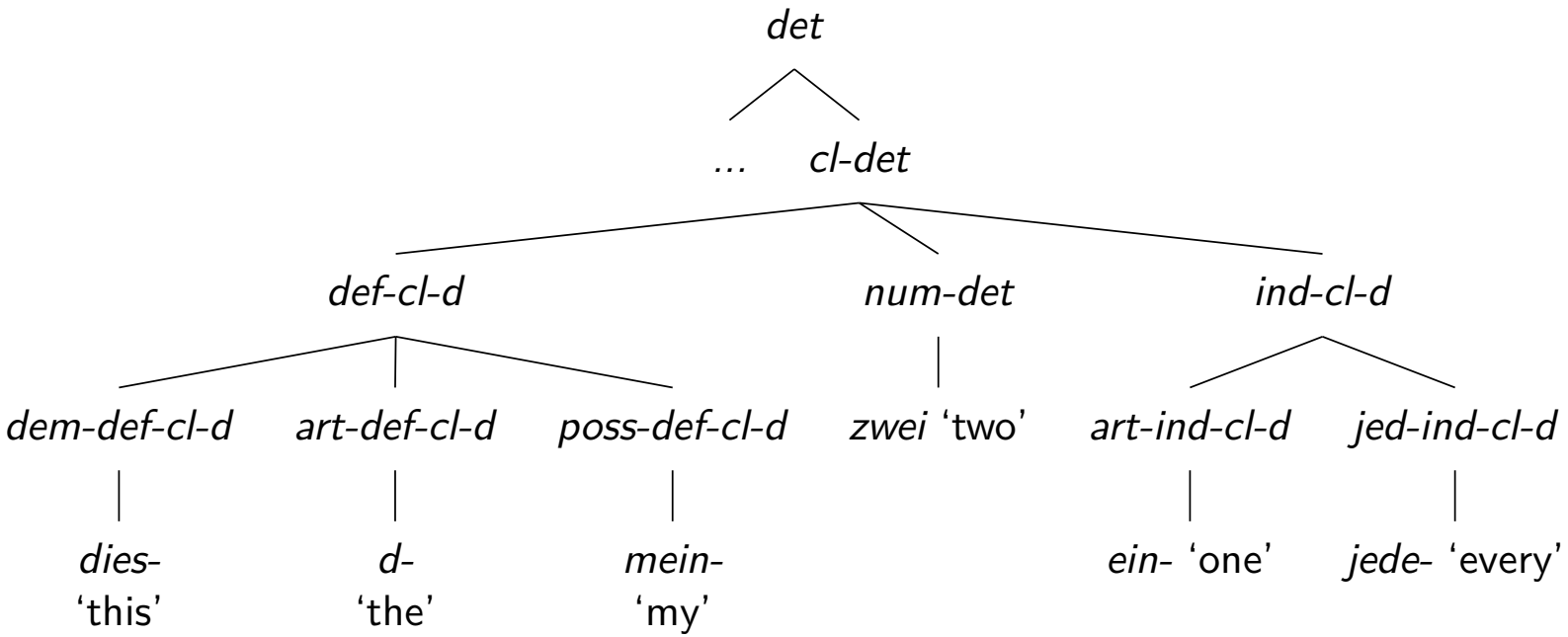
The specifier of a classifier can be:

- *dies-* 'this' (*dem-def-cl-d*)
  *dieses Stück Vieh*
  'this head of cattle'
- *d-* 'the' (*art-def-cl-d*)
  *das Stück Vieh*
  'the head of cattle'
- *mein-* 'my' (*poss-def-cl-d*)
  *unsere 8 Stück Vieh*
  'our 8 heads of cattle'
- *zwei* 'two' (*num-det*)
  *zwei Stück Vieh*
  'two heads of cattle'
- *ein-* 'one' (*art-ind-cl-d*)
  *ein Stück Vieh*
  'a head of cattle'
- *jede-* 'every' (*jed-ind-cl-d*).
  *jedes Stück Vieh*
  'every head of cattle'

# Case 1: when Num is other than one

(19) Hierarchy of Det HEAD values



# Case 1: when Num is other than one

Two numerals, no matter whether *num-det*+*num-adj* or iteration of *num-adj*, are not possible for semantic reasons:
→ there should be only one *card-rel* per *index*.

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Two numerals, no matter whether *num-det+num-adj* or iteration of *num-adj*, are not possible for semantic reasons:
→ there should be only one *card-rel* per *index*.

The combination of *ind-cl-d* and *num-adj* in cases such as (20) is ruled out:
→ because a *num-adj* only modifies an NP with [NUM *pl*].

(20) * ein / jedes zwei Stück Vieh
one every two SCL cattle
Int: 'a / every two head of cattle'

# Further empirical evidence

This underspecified treatment of Num is further supported by empirical evidence.

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(21) a. ein Thema dieses Jahr-es
a theme this.DET.GEN.ST year-GEN
'a theme of this year'

b. ein Thema dies-en Jahr-es
a theme this.ADJ-GEN.ST year-GEN
'a theme of this year'

c. ein Thema letzt-en Jahr-es
a theme last.ADJ.GEN.ST year-GEN
'a topic of last year'

(21b) can also be declined as an adjective analog to (21c).
→ HEAD value of *dies-* 'this' is underspecified.

# Case 1: when Num is other than one

(22) Lexical entry for *Stück* 'SCL'

$$\left[\begin{array}{ll}
\text{CAT} & \left[\begin{array}{ll}
\text{HEAD} & \left[\begin{array}{ll}\text{CONC} & \boxed{4}\left[\text{CASE} \quad \boxed{3}\right] \\ \textit{sort-cl-c-n} & \end{array}\right] \\
\text{SPR} & \left\langle \text{DET} \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll}\text{CONC} & \boxed{4} \\ \textit{cl-det} & \end{array}\right] \\ \text{COMPS} & \langle\rangle \end{array}\right] \right\rangle \\
\text{COMPS} & \left\langle \text{NP} \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll}\text{CONC} & \left[\text{CASE} \quad \boxed{3}\right] \\ \textit{m-n} & \end{array}\right] \\ \text{IND} & \boxed{1} \end{array}\right] \right\rangle
\end{array}\right] \\
\text{CONT} & \left[\begin{array}{ll}
\text{IND} & \boxed{1} \\
\text{RELS} & \left\langle \left[\begin{array}{ll}\textit{stück} & \\ \text{ARG} & \boxed{1}\end{array}\right] \right\rangle
\end{array}\right]
\end{array}\right]$$

# Case 2: iff Num=1

When Num is 1, i.e. *ein-* ‘one’ or *jede-* ‘every’:

# Case 2: iff Num=1

When Num is 1, i.e. *ein-* 'one' or *jede-* 'every':

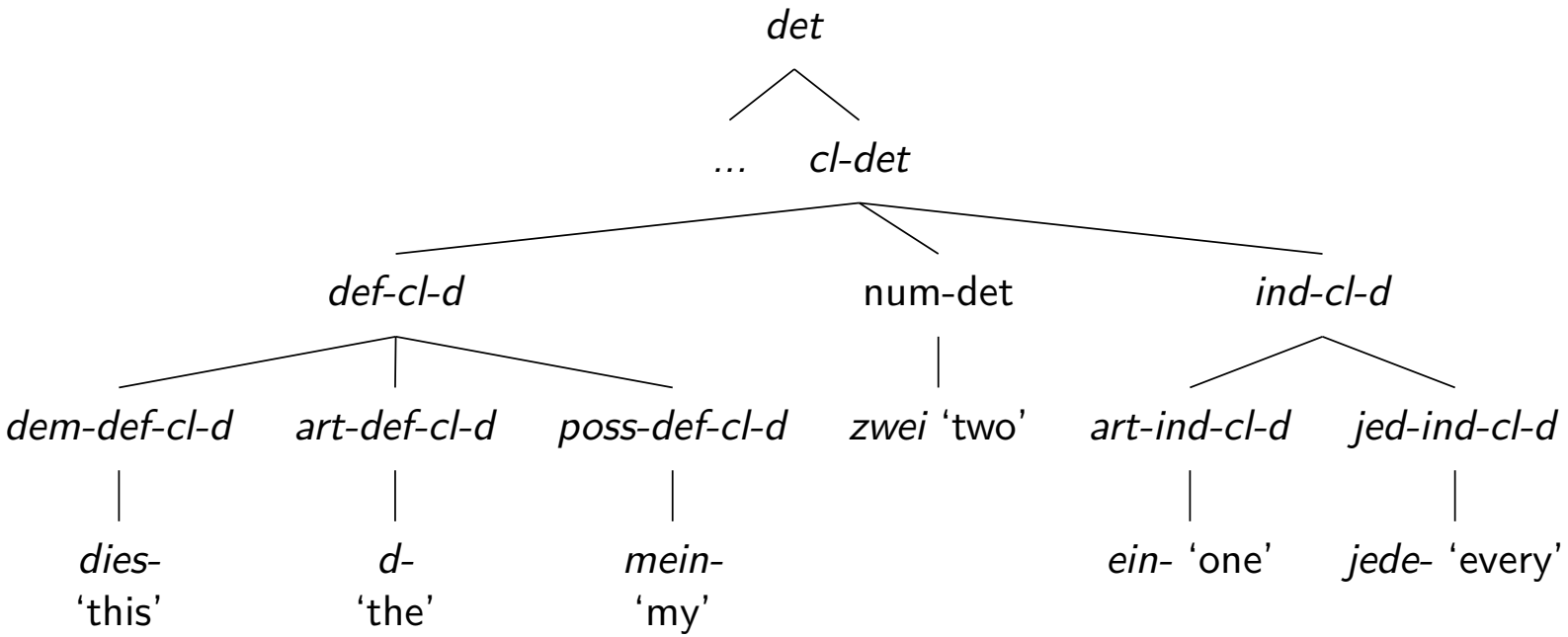
- It can only be a determiner.
- *art-ind-cl-d* must be fixed in the second position after the definite determiner.

(23) a. diese ein-e klein-e Scheibe Brot
that one.WK.SG small-WK.SG slice.MCL bread
'this one small slice of bread'

b. * diese kleine eine Scheibe Brot
that small-WK.SG one.WK.SG slice.MCL bread
'this one small slice of bread'

# Case 2: iff Num=1

(24) Hierarchy of Det HEAD values



# Case 2: iff Num=1

**Solution**: a compound structure *compl-det* combining a *def-cl-d* and *art-ind-cl-d*

(25) *compl-det* ⇒

$$\left[\begin{array}{l}\text{DTRS} \left\langle \text{H}\left[\begin{array}{ll}\text{CAT}|\text{HEAD} & \left[\begin{array}{ll}\text{SPEC} & \textit{c-n}\left[\text{CONC}\ \boxed{1}\right] \\ \text{CONC}\ \boxed{1} & \\ \textit{def-cl-d} & \end{array}\right] \\ \text{CONT} & \boxed{2}\end{array}\right], \left[\begin{array}{ll}\text{CAT}|\text{HEAD} & \left[\begin{array}{ll}\text{SPEC} & \textit{c-n}\left[\text{CONC}\ \boxed{1}\right] \\ \text{CONC}\ \boxed{1} & \\ \textit{art-ind-cl-d} & \end{array}\right]\end{array}\right]\right\rangle \\ \text{CONT}\ \ \boxed{2}\end{array}\right]$$

# Case 2: iff Num=1

This complex determiner has *def-cl-d* as its head and can be selected by a *c-n* (not only by a *cl-c-n*), which correctly predicts (26) in German.

(26) das eine Buch
that one.WK.SG buch
'the one book'

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# Conclusions

This paper provides an HPSG analysis for German numeral classifiers.

- German has classifiers.
- Classifiers are the head of Num-CL-N.
- Classifiers in German take N2 as a complement and need a specifier.
- This specifier can be a determiner or a numeral.
- The HEAD value of a numeral is underspecified with two subtypes *num-det* and *num-adj* (when Num is other than one),
  → to allow the possibility of Det-Mod-Num.
- Iff Num=1, a *comp-det* is introduced for ensuring that nothing can be inserted between these two determiners.

- Thanks to Marc Felfe for his valuable judgement on the German examples.
- Thanks to the three anonymous reviewers for their constructive feedback.
- Thanks to Stefan Müller, Giuseppe Varaschin, Antonio Machicao y Priemer as well as the audience of the Syntax-Semantics Colloquium at HU Berlin for the engaging discussions and suggestions.

Further work

- Partitive constructions
  → *zwei Stück Viel* vs. *zwei Stücke Vieh*
- Quantifiers
  → *Alle Scheiben Brot*

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