

Cross-Lingual Semantic Mapping of Authority Files

Nadine Steinmetz, and Harald Sack

November, 26th 2013
Conference on Semantic Web in Libraries
SWIB 2013, Hamburg, Germany

- **Semantic Annotation of Textual Information:**

Having grown up in the San Francisco Bay Area and lived in New York City during his turn on “Saturday Night Live,” Mr. Forte said coastal cities were about all he had known before shooting began in this stretch of the Great Plains.¹

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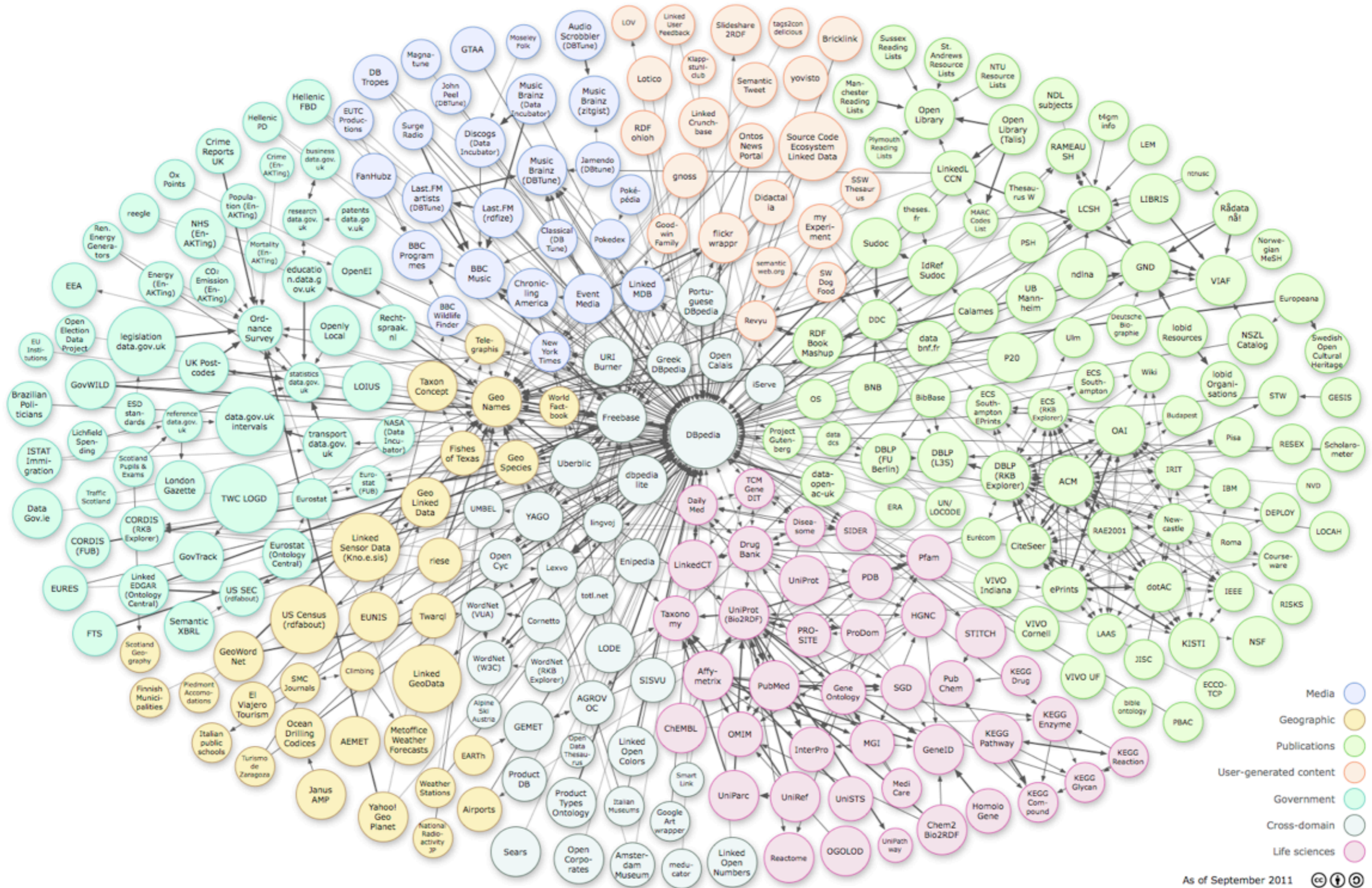
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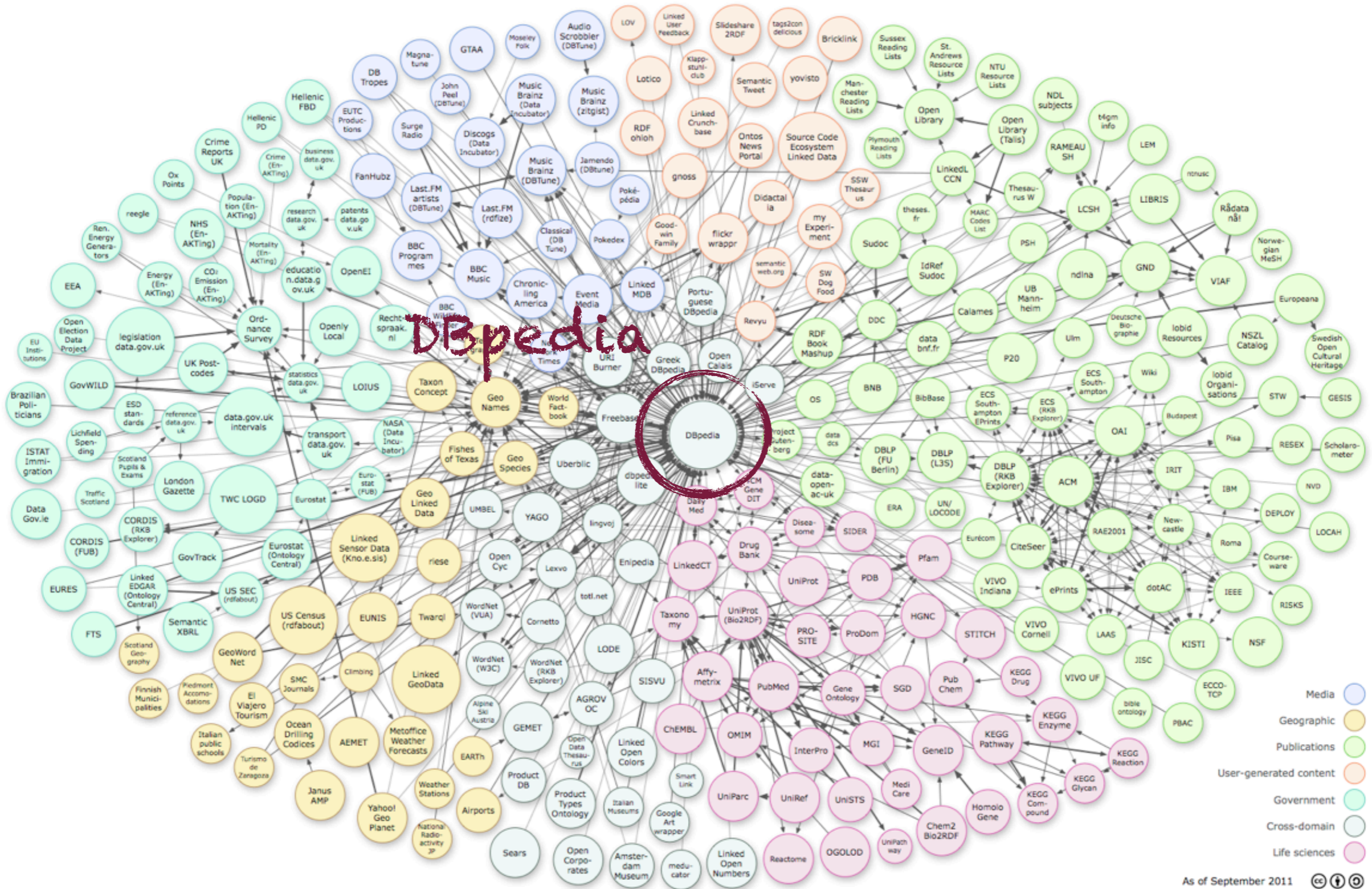
Required: A general purpose knowledge base containing named entities and other concepts.

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Motivation



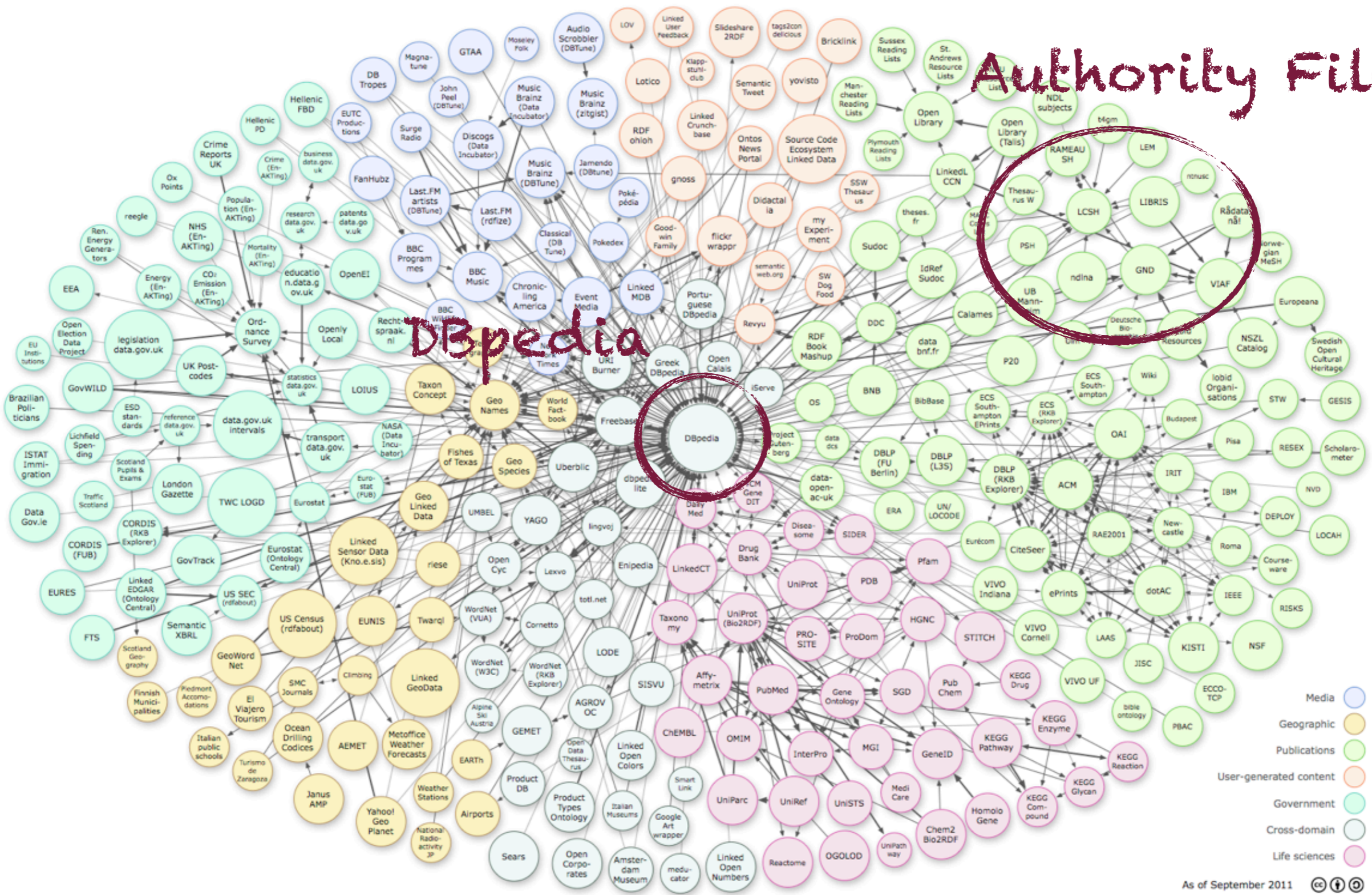
Motivation



Motivation

Authority Files

DBpedia



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Motivation

Having grown up in the San Francisco Bay Area and lived in New York City during his turn on “Saturday Night Live,” Mr. Forte said coastal cities were about all he had known before shooting began in this stretch of the Great Plains.¹



Allen Forte
Bruno Forte
Jonathan Forte
Rocco Forte
Joe Forte
Joseph Forte
Will Forte
...

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Motivation

Having grown up in the San Francisco Bay Area and lived in New York City during his turn on “Saturday Night Live,” Mr. Forte said coastal cities were about all he had known before shooting began in this stretch of the Great Plains.¹

Will Forte (born June 17, 1970) is an American comedic actor and writer best known for his roles as a cast member on [Saturday Night Live](#) (2002–2010), the title character of its spin-off film [MacGruber](#), and Paul L'Astnamé in [30 Rock](#).



?

Allen Forte
Bruno Forte
Jonathan Forte
Rocco Forte
Joe Forte
Joseph Forte
Will Forte
...

¹ taken from <http://www.nytimes.com/2013/11/24/travel/will-forte-on-the-glories-of-the-great-plains.html?ref=travel>

GND vs. LCSH vs. VIAF vs. DBpedia

Will Forte, US actor and screenwriter


GND vs. LCSH vs. VIAF vs. DBpedia

Will Forte, US actor and screenwriter

GND	
Link zu diesem Datensatz	http://d-nb.info/gnd/143041460
Person	Forte, Will
Geschlecht	männlich
Quelle	Movie Database
Zeit	Lebensdaten: 1970-
Land	USA (XD-US)
Geografischer Bezug	Geburtsort: Alameda
Beruf(e)	Schauspieler
Weitere Angaben	Amerikan. Schauspieler, Drehbuchautor und Filmproduzent sowie Filmschaffender
Typ	Person (piz)

GND vs. LCSH vs. VIAF vs. DBpedia

Details Visualization

 **Forte, Will**

URI(s)
> <http://id.loc.gov/authorities/names/no2006064255>

Instance Of
> [MADS/RDF PersonalName](#)
> [MADS/RDF Authority](#)
> [SKOS Concept](#) ↗

Scheme Membership(s)
> [Library of Congress Name Authority File](#)

Collection Membership(s)
> [Names Collection - Authorized Headings](#)
> [LC Names Collection - General Collection](#)

Exact Matching Concepts from Other Schemes
> <http://viaf.org/viaf/sourceID/LC%7Cno2006064255#skos:Concept> ↗

Sources
> found: The brothers Solomon, 2005: t.p. (Will Forte; screenwriter)


Change Notes
> 2006-06-21: new

GND vs. LCSH vs. VIAF vs. DBpedia


Forte, Will 

VIAF ID:292467627 (Person)
Permalink:<http://viaf.org/viaf/292467627>

- Vorzugsbezeichnungen

  [100 1 _ ta Forte, Will](#)

- Ausgewählte Titel

1. The brothers Solomon, 2005: (1) 

+ Veröffentlichungstatistik

- Über

Informationen zur Person
Externe Links
[WorldCat Identities](#)

Motivation

	Advantages	Disadvantages
Authority Files	<ul style="list-style-type: none"> manually maintained aggregation by subjectareas 	<ul style="list-style-type: none"> few descriptive texts few relationships single-lingual
DBpedia/ WikiData/ Freebase	<ul style="list-style-type: none"> crowd-sourced descriptive texts relationships to other entities many links to other datasets many different language versions 	<ul style="list-style-type: none"> crowd-sourced noisy data

Motivation

	Advantages	Disadvantages
Authority Files	<ul style="list-style-type: none"> manually maintained aggregation by subject area 	<ul style="list-style-type: none"> texts
DBpedia/ Wikidata/ Freebase	<ul style="list-style-type: none"> descriptive texts relationships to other entities many links to other datasets many different language versions 	<ul style="list-style-type: none"> crowd-sourced noisy data

Join advantages of the datasets and reduce disadvantages

Related Work

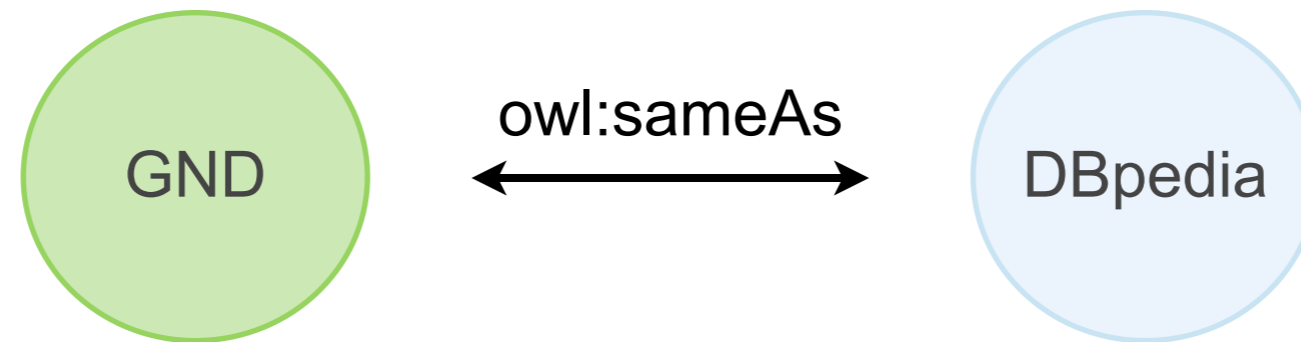
- MACS project:
 - ▶ Rameau ↔ LCSH ↔ GND (no links to DBpedia)
 - ▶ Results not published before 2017
- Beacon project
 - ▶ GND ↔ German Wikipedia
 - ▶ ~255.000 mappings
 - ▶ Mainly persons

Related Work

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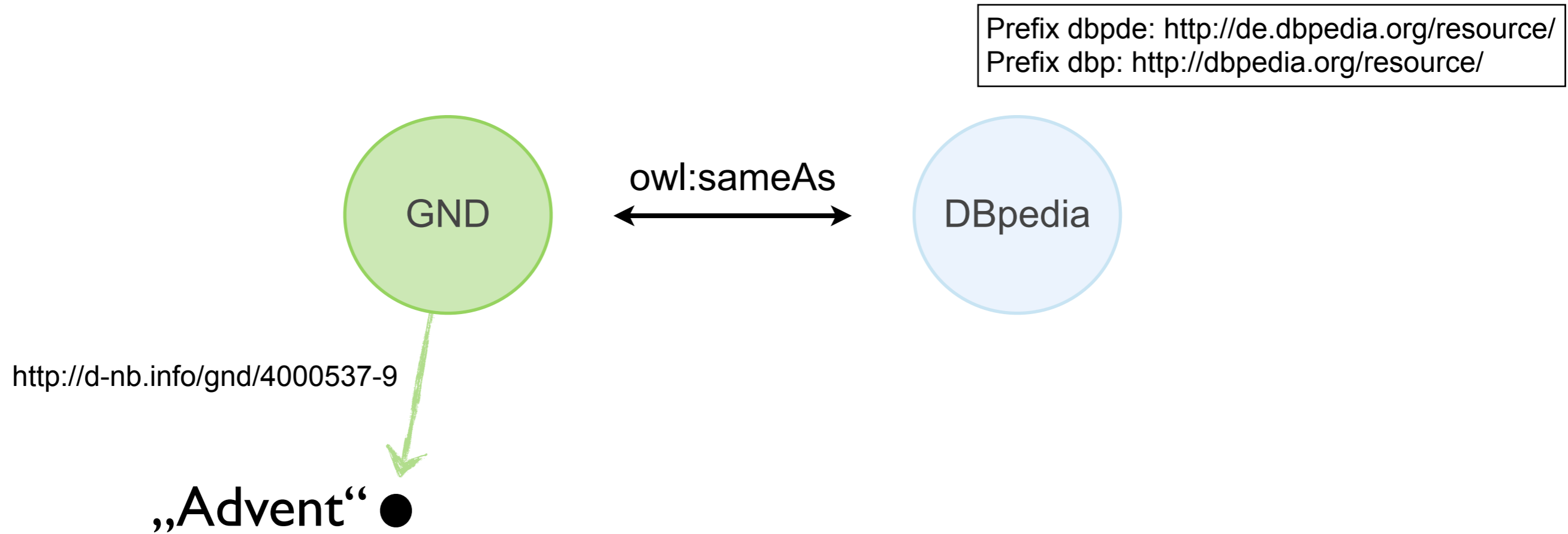
Our focus: Mapping of subject headings
GND ↔ DBpedia

Approach



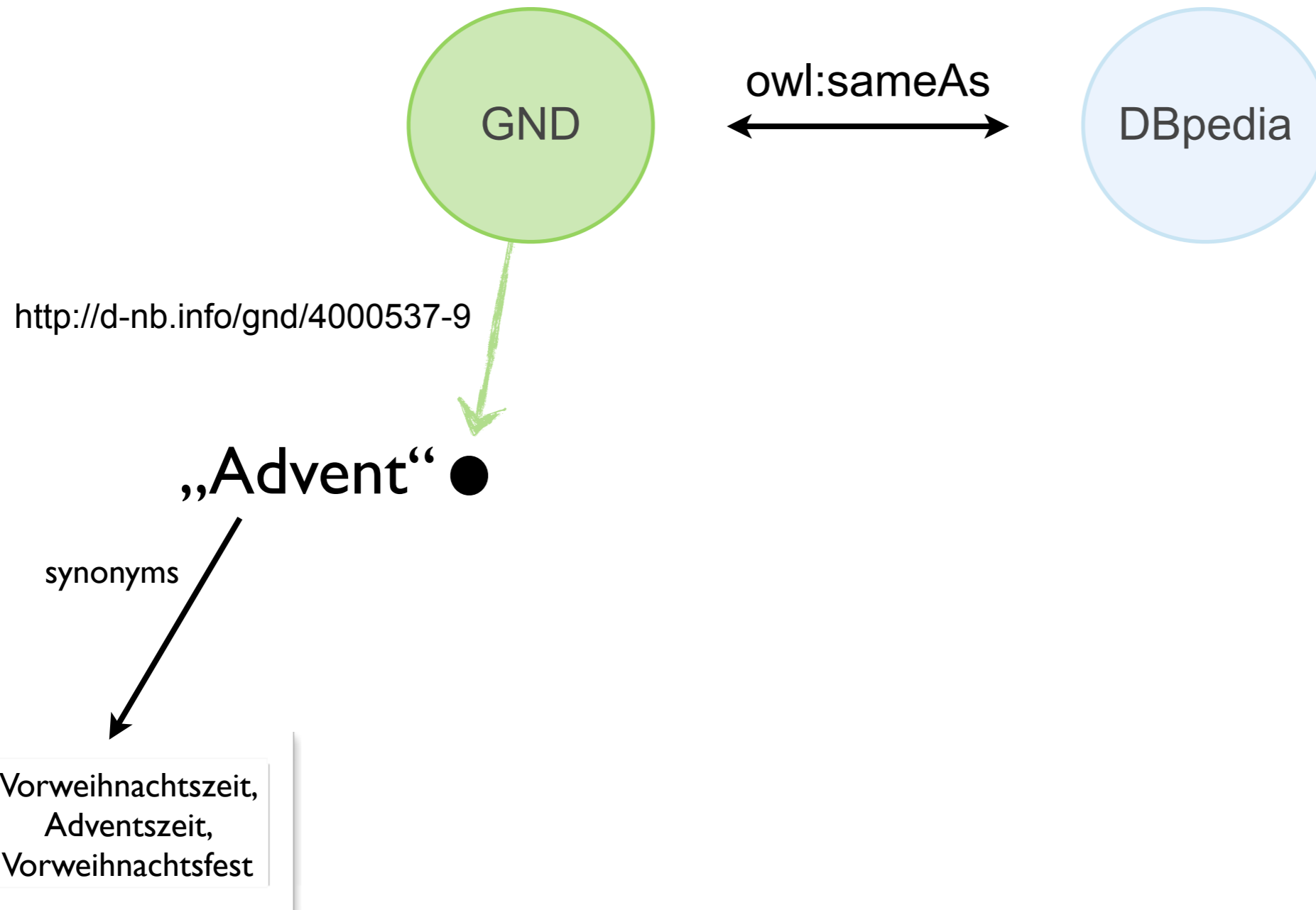
Prefix dbpde: <http://de.dbpedia.org/resource/>
Prefix dbp: <http://dbpedia.org/resource/>

Approach



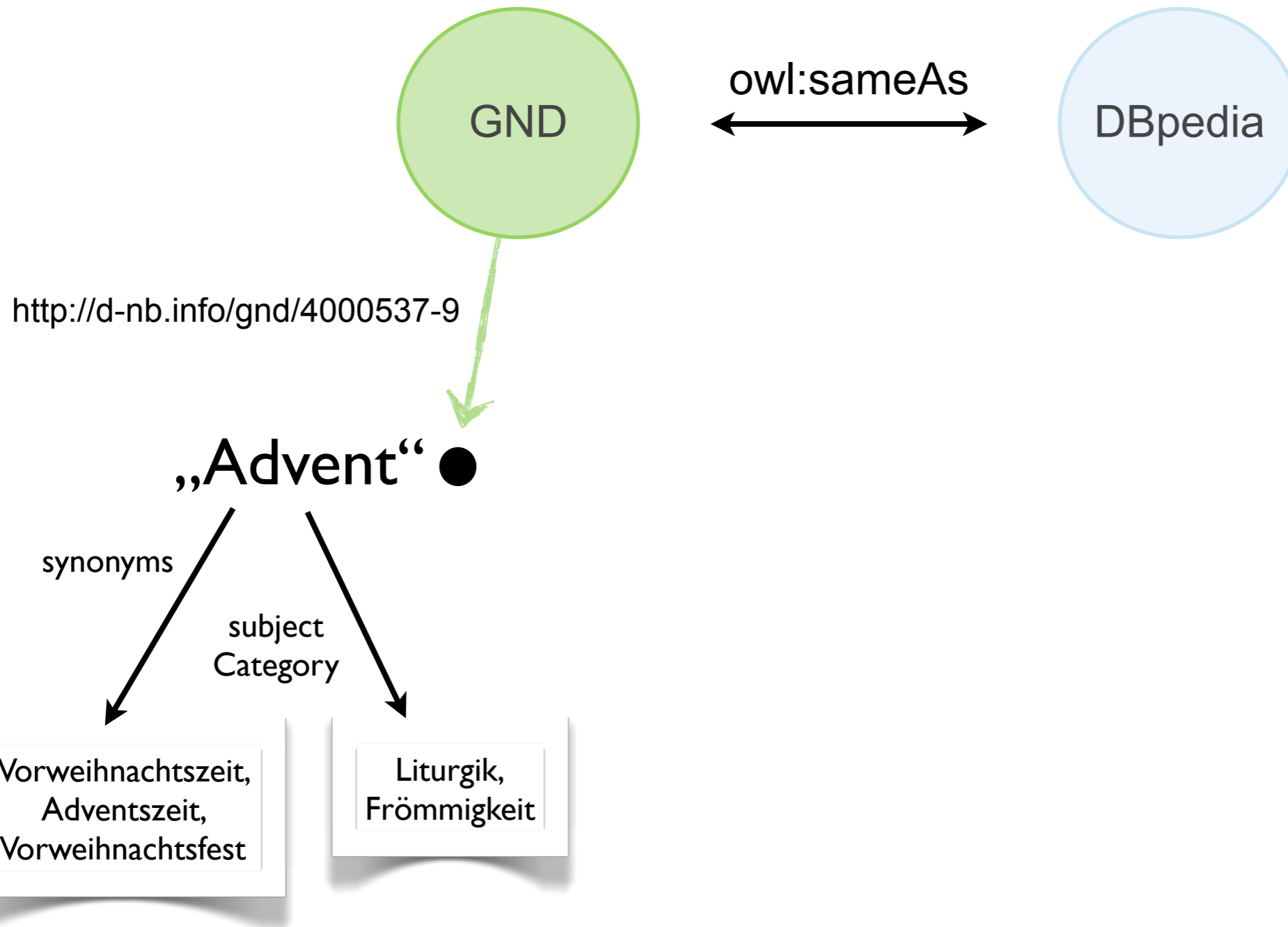
Approach

Prefix dbpde: <http://de.dbpedia.org/resource/>
Prefix dbp: <http://dbpedia.org/resource/>



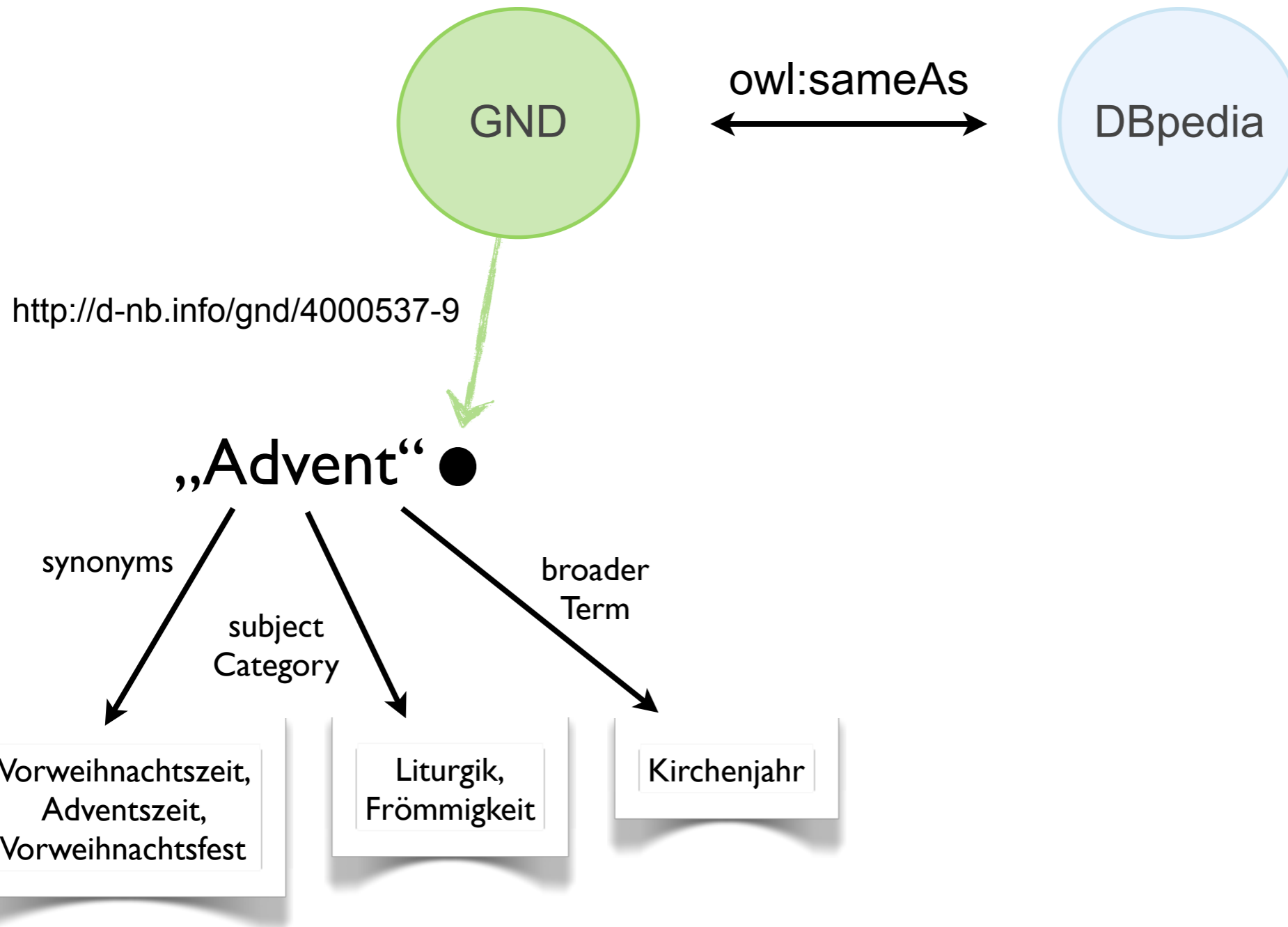
Approach

Prefix dbpde: <http://de.dbpedia.org/resource/>
Prefix dbp: <http://dbpedia.org/resource/>



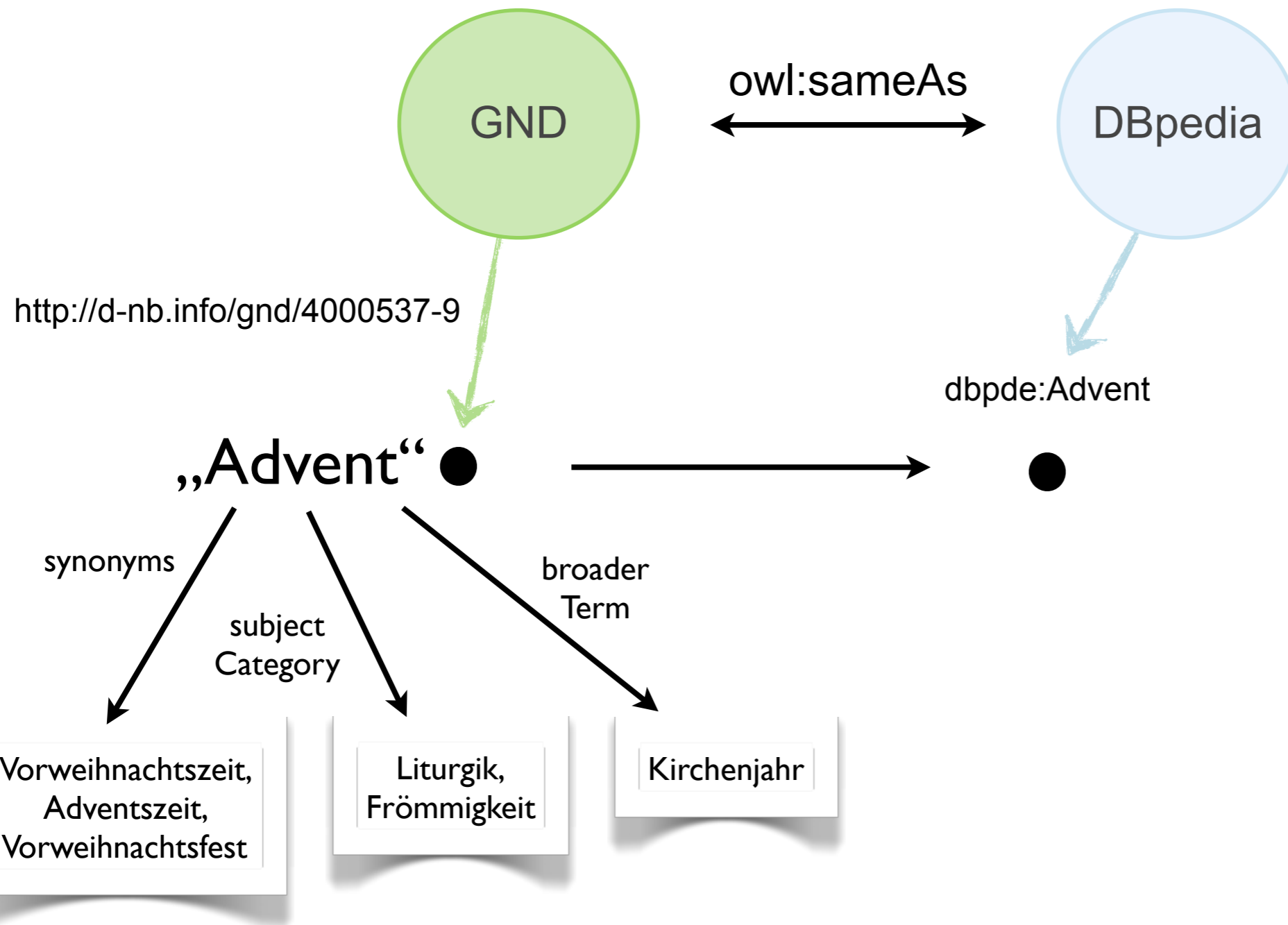
Approach

Prefix dbpde: <http://de.dbpedia.org/resource/>
Prefix dbp: <http://dbpedia.org/resource/>



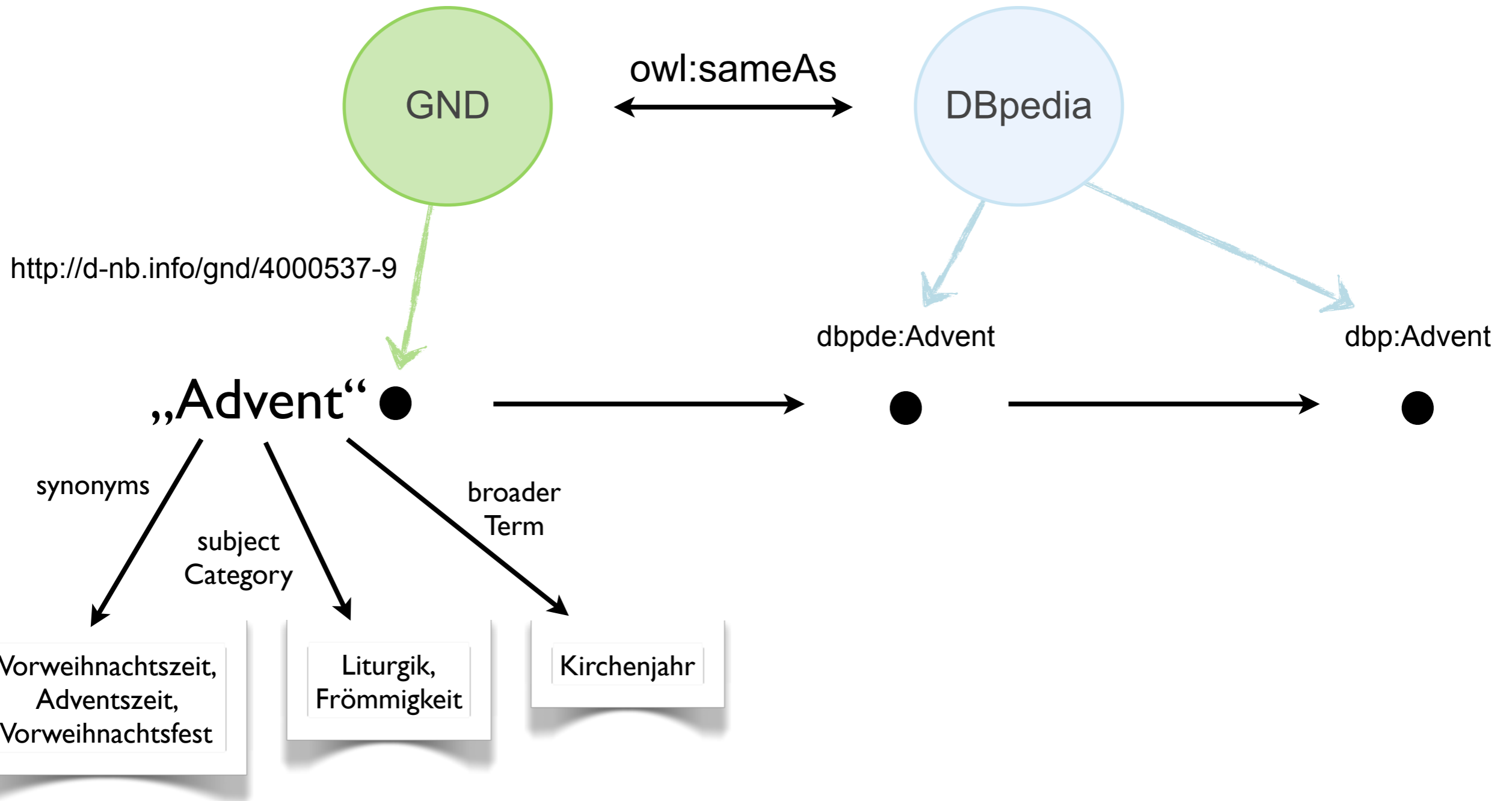
Approach

Prefix dbpde: <http://de.dbpedia.org/resource/>
 Prefix dbp: <http://dbpedia.org/resource/>



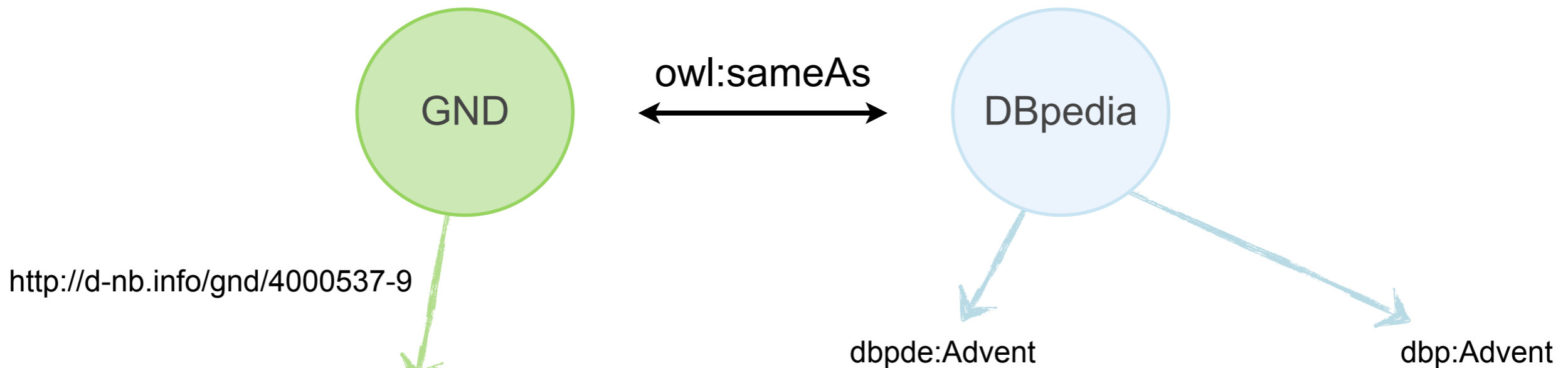
Approach

Prefix dbpde: <http://de.dbpedia.org/resource/>
Prefix dbp: <http://dbpedia.org/resource/>



Approach

Prefix dbpde: <http://de.dbpedia.org/resource/>
Prefix dbp: <http://dbpedia.org/resource/>



„Advent“ ●

synonyms

subject Category

broader Term

Vorweihnachtszeit,
Adventszeit,
Vorweihnachtsfest

Liturgik,
Frömmigkeit

Kirchenjahr

About: Advent
An Entity of Type : [Thing](#), from Named Graph : <http://de.dbpedia.org>, within Data Space : [de.dbpedia.org](#)

About: Advent
An Entity of Type : [Thing](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)

Property

Property	Value
dbpedia-owl:abstract	Advent is a season observed in many Western Christian churches as a time of expectant waiting and preparation for the celebration of the Nativity of Jesus at Christmas. The term is an anglicized version of the Latin word adventus, meaning "coming." It is the beginning of the Western liturgical year and commences on Advent Sunday.
dbpedia-owl:thumbnail	
dbpedia-owl:wikiPageExternalLink	
dbpedia-owl:wikiPageID	
dbpedia-owl:wikiPageInterLanguageLink	

<http://d-nb.info/gnd/4000537-9>

„Advent“

synonyms

Vorweihnachtszeit,
Adventszeit,
Vorweihnachtsfest

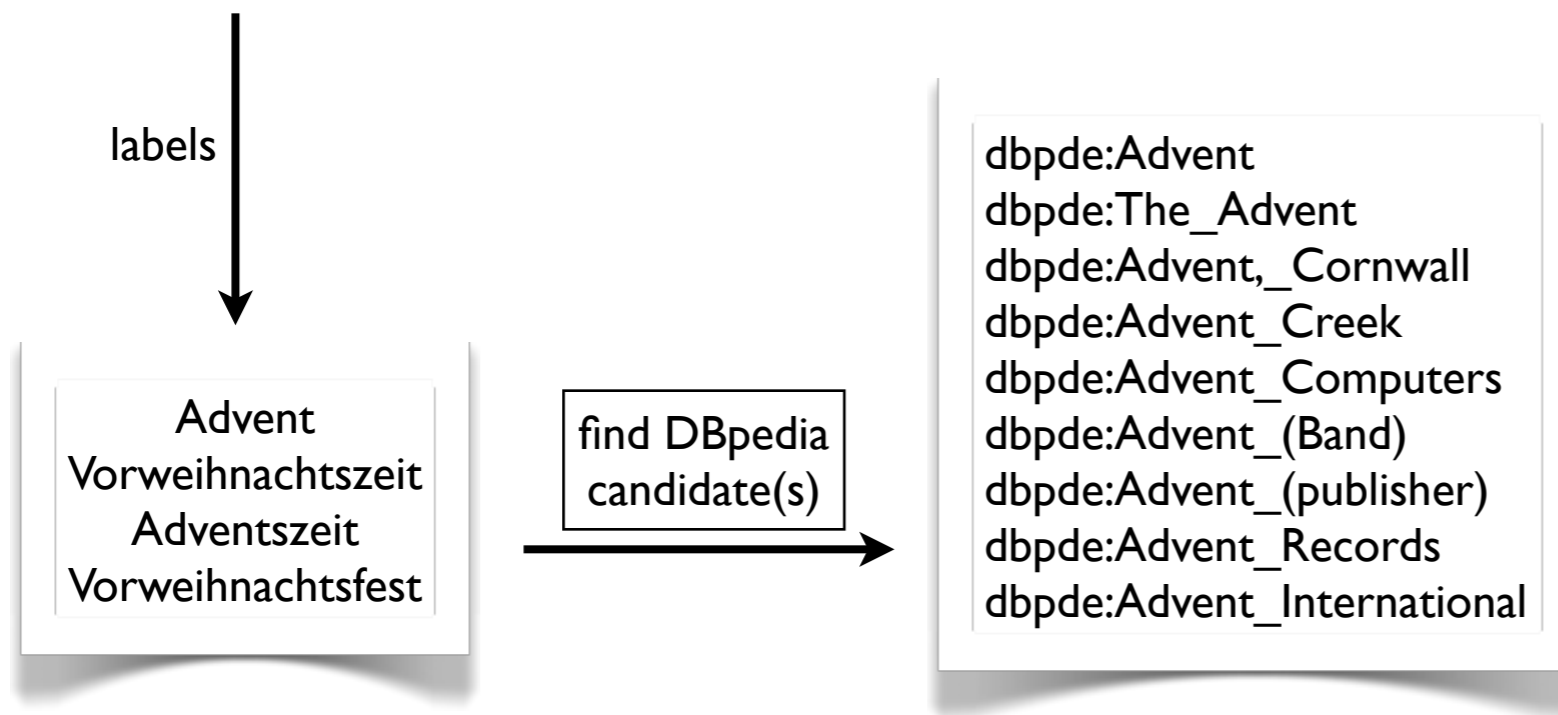
<http://d-nb.info/gnd/4000537-9>

labels



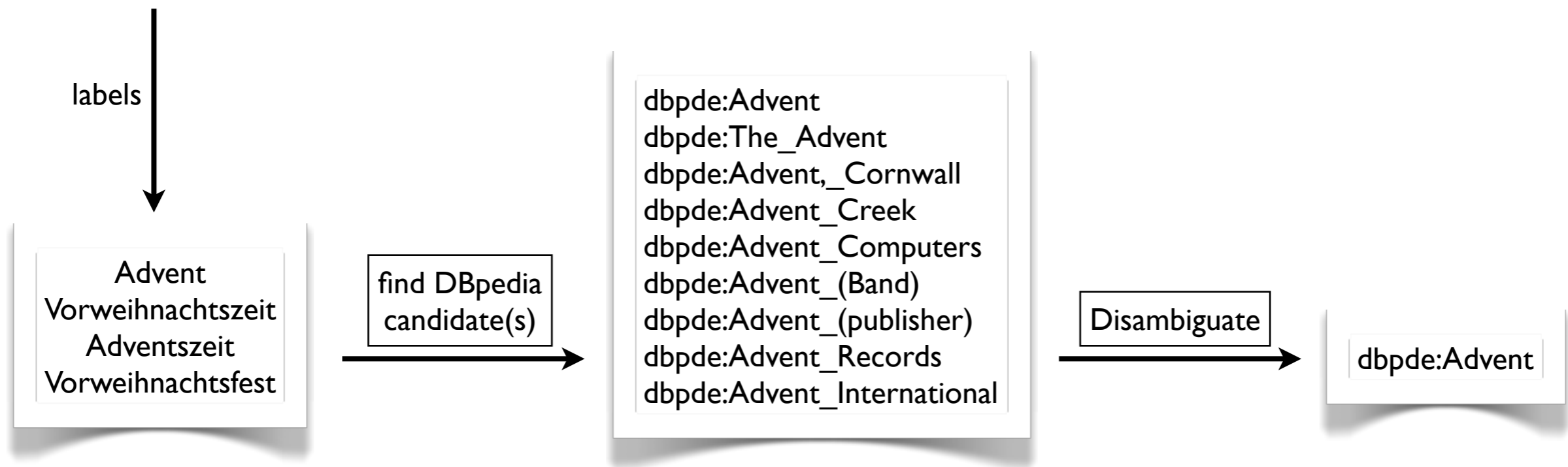
Advent
Vorweihnachtszeit
Adventszeit
Vorweihnachtsfest

<http://d-nb.info/gnd/4000537-9>



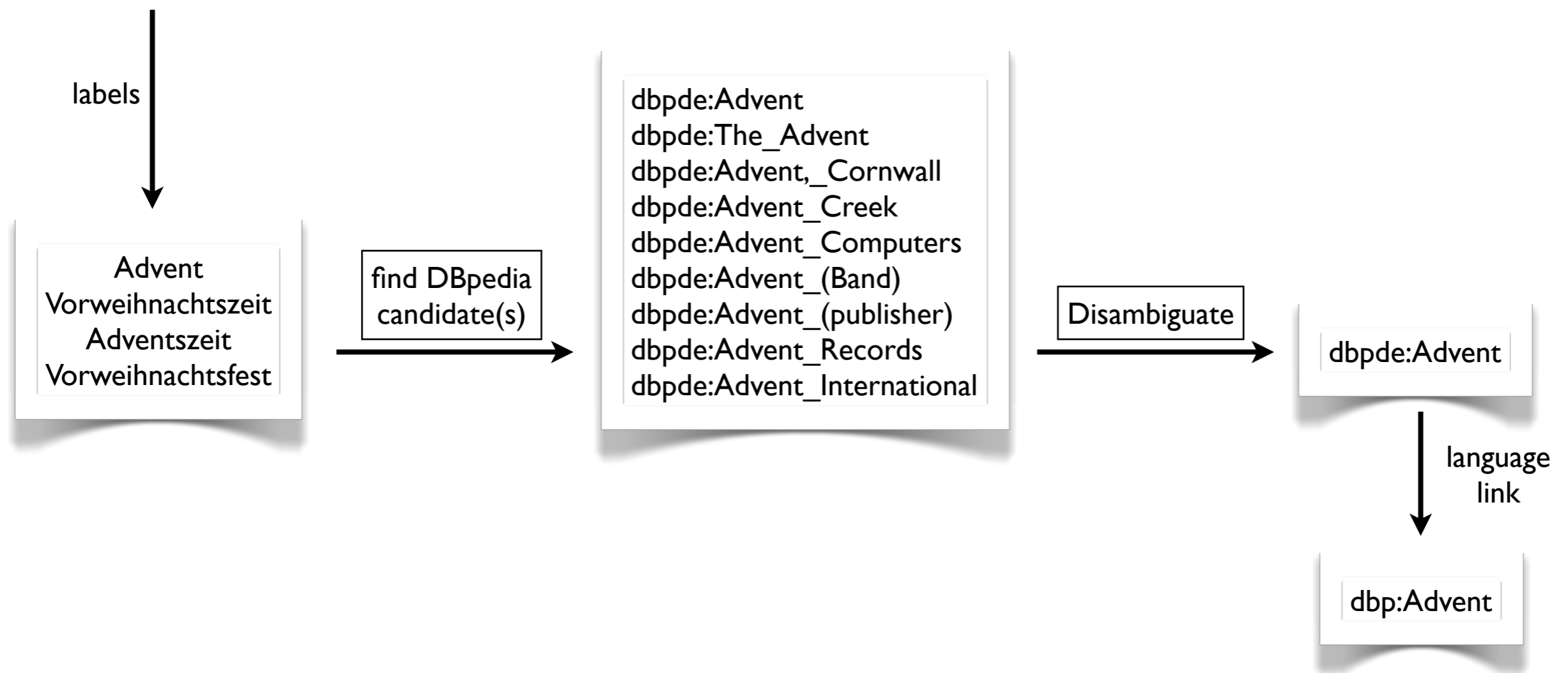
Approach

<http://d-nb.info/gnd/4000537-9>

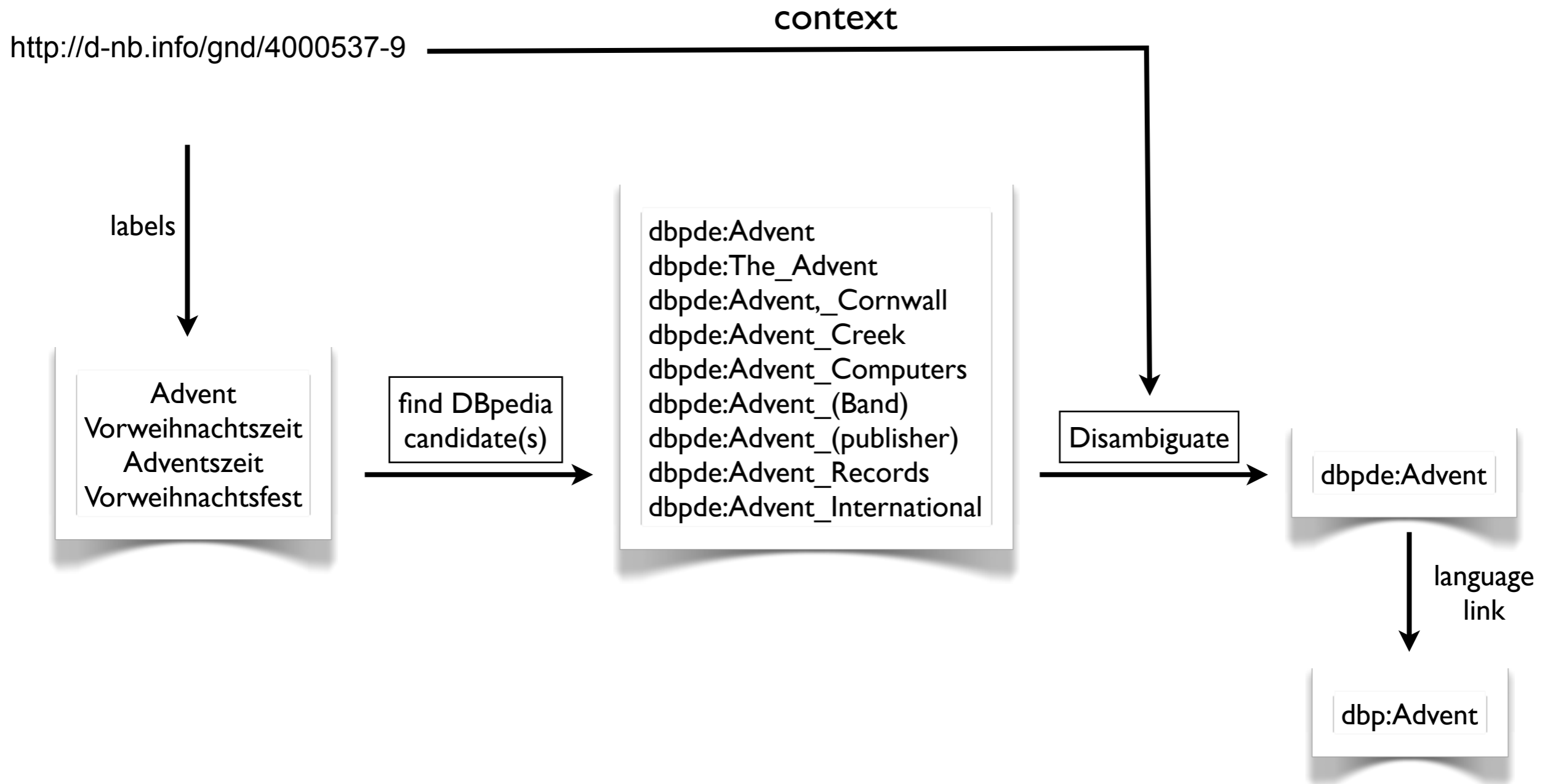


Approach

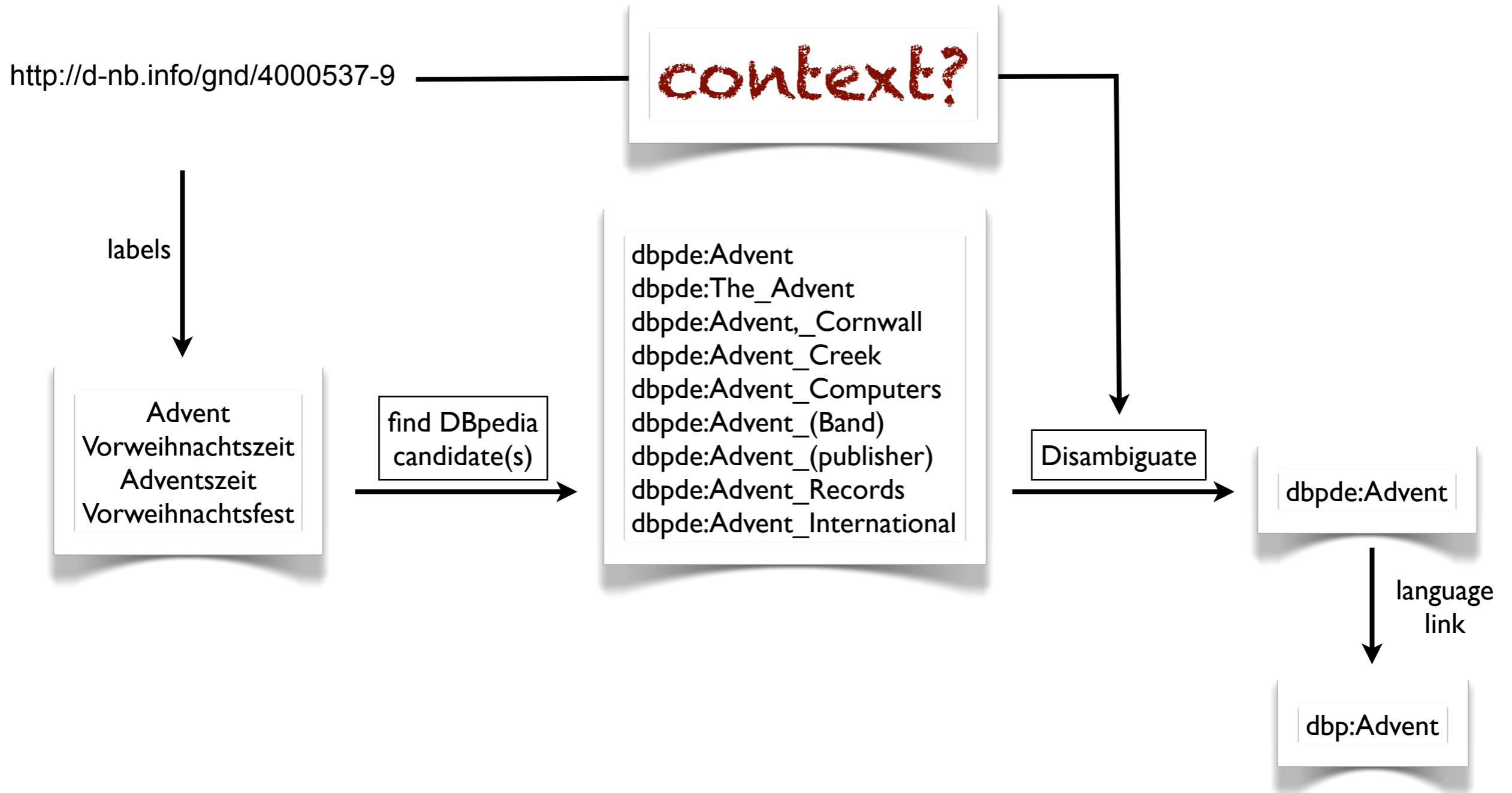
<http://d-nb.info/gnd/4000537-9>



Approach



Approach



„Advent“ as RDF in GND

context:

```
- <rdf:RDF>
- <rdf:Description rdf:about="http://d-nb.info/gnd/4000537-9">
  <gnd:gndIdentifier>4000537-9</gnd:gndIdentifier>
  <gnd:oldAuthorityNumber>(DE-588c)4000537-9</gnd:oldAuthorityNumber>
  <gnd:relatedDdcWithDegreeOfDeterminacy2 rdf:resource="http://d-nb.info/ddc/class/263.91"/>
  <gnd:relatedDdcWithDegreeOfDeterminacy3 rdf:resource="http://d-nb.info/ddc/class/263.912"/>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtsfest</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Adventszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:preferredNameForTheSubjectHeading>Advent</gnd:preferredNameForTheSubjectHeading>
  <gnd:broaderTermGeneral rdf:resource="http://d-nb.info/gnd/4030726-8"/>
  <gnd:gndSubjectCategory rdf:resource="http://d-nb.info/standards/vocab/gnd/gnd-sc#3.5a"/>
  <rdf:type rdf:resource="http://d-nb.info/standards/elementset/gnd#SubjectHeading"/>
</rdf:Description>
</rdf:RDF>
```

Context of a GND entity

„Advent“ as RDF in GND

context:

Labels

```
- <rdf:RDF>
- <rdf:Description rdf:about="http://d-nb.info/gnd/4000537-9">
  <gnd:gndIdentifier>4000537-9</gnd:gndIdentifier>
  <gnd:oldAuthorityNumber>(DE-588c)4000537-9</gnd:oldAuthorityNumber>
  <gnd:relatedDdcWithDegreeOfDeterminacy2 rdf:resource="http://d-nb.info/ddc/class/263.91"/>
  <gnd:relatedDdcWithDegreeOfDeterminacy3 rdf:resource="http://d-nb.info/ddc/class/263.912"/>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtsfest</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Adventszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:preferredNameForTheSubjectHeading>Advent</gnd:preferredNameForTheSubjectHeading>
  <gnd:broaderTermGeneral rdf:resource="http://d-nb.info/gnd/4030726-8"/>
  <gnd:gndSubjectCategory rdf:resource="http://d-nb.info/standards/vocab/gnd/gnd-sc#3.5a"/>
  <rdf:type rdf:resource="http://d-nb.info/standards/elementset/gnd#SubjectHeading"/>
</rdf:Description>
</rdf:RDF>
```

Context of a GND entity

„Advent“ as RDF in GND

context:

Labels

broader terms

```
- <rdf:RDF>
- <rdf:Description rdf:about="http://d-nb.info/gnd/4000537-9">
  <gnd:gndIdentifier>4000537-9</gnd:gndIdentifier>
  <gnd:oldAuthorityNumber>(DE-588c)4000537-9</gnd:oldAuthorityNumber>
  <gnd:relatedDdcWithDegreeOfDeterminacy2 rdf:resource="http://d-nb.info/ddc/class/263.91"/>
  <gnd:relatedDdcWithDegreeOfDeterminacy3 rdf:resource="http://d-nb.info/ddc/class/263.912"/>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtsfest</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Adventszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:preferredNameForTheSubjectHeading>Advent</gnd:preferredNameForTheSubjectHeading>
  <gnd:broaderTermGeneral rdf:resource="http://d-nb.info/gnd/4030726-8"/>
  <gnd:gndSubjectCategory rdf:resource="http://d-nb.info/standards/vocab/gnd/gnd-sc#3.5a"/>
  <rdf:type rdf:resource="http://d-nb.info/standards/elementset/gnd#SubjectHeading"/>
</rdf:Description>
</rdf:RDF>
```


Context of a GND entity

„Advent“ as RDF in GND

context:

Labels

broader terms

```
- <rdf:RDF>
- <rdf:Description rdf:about="http://d-nb.info/gnd/4000537-9">
  <gnd:gndIdentifier>4000537-9</gnd:gndIdentifier>
  <gnd:oldAuthorityNumber>(DE-588c)4000537-9</gnd:oldAuthorityNumber>
  <gnd:relatedDdcWithDegreeOfDeterminacy2 rdf:resource="http://d-nb.info/ddc/class/263.91"/>
  <gnd:relatedDdcWithDegreeOfDeterminacy3 rdf:resource="http://d-nb.info/ddc/class/263.912"/>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtsfest</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Adventszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:variantNameForTheSubjectHeading>Vorweihnachtszeit</gnd:variantNameForTheSubjectHeading>
  <gnd:preferredNameForTheSubjectHeading>Advent</gnd:preferredNameForTheSubjectHeading>
  <gnd:broaderTermGeneral rdf:resource="http://d-nb.info/gnd/4030726-8"/>
  <gnd:gndSubjectCategory rdf:resource="http://d-nb.info/standards/vocab/gnd/gnd-sc#3.5a"/>
  <rdf:type rdf:resource="http://d-nb.info/standards/elementset/gnd#SubjectHeading"/>
</rdf:Description>
</rdf:RDF>
```

Kirchenjahr

Context of a GND entity

„Advent“ as RDF in GND

context:

Labels

broader terms

subject category

```
<rdf:RDF>
  <rdf:Description rdf:about="http://d-nb.info/gnd/4000537-9">
    <gnd:gndIdentifier>4000537-9</gnd:gndIdentifier>
    <gnd:oldAuthorityNumber>(DE-588c)4000537-9</gnd:oldAuthorityNumber>
    <gnd:relatedDdcWithDegreeOfDeterminacy2 rdf:resource="http://d-nb.info/ddc/class/263.91"/>
    <gnd:relatedDdcWithDegreeOfDeterminacy3 rdf:resource="http://d-nb.info/ddc/class/263.912"/>
    <gnd:variantNameForTheSubjectHeading>Vorweihnachtsfest</gnd:variantNameForTheSubjectHeading>
    <gnd:variantNameForTheSubjectHeading>Adventszeit</gnd:variantNameForTheSubjectHeading>
    <gnd:variantNameForTheSubjectHeading>Vorweihnachtszeit</gnd:variantNameForTheSubjectHeading>
    <gnd:preferredNameForTheSubjectHeading>Advent</gnd:preferredNameForTheSubjectHeading>
    <gnd:broaderTermGeneral rdf:resource="http://d-nb.info/gnd/4030726-8"/>
    <gnd:gndSubjectCategory rdf:resource="http://d-nb.info/standards/vocab/gnd/gnd-sc#3.5a"/>
    <rdf:type rdf:resource="http://d-nb.info/standards/elementset/gnd#SubjectHeading"/>
  </rdf:Description>
</rdf:RDF>
```

Kirchenjahr

Context of a GND entity

„Advent“ as RDF in GND

context:

Labels

broader terms

subject category

```

<rdf:RDF>
  <rdf:Description rdf:about="http://d-nb.info/gnd/4000537-9">
    <gnd:gndIdentifier>4000537-9</gnd:gndIdentifier>
    <gnd:oldAuthorityNumber>(DE-588c)4000537-9</gnd:oldAuthorityNumber>
    <gnd:relatedDdcWithDegreeOfDeterminacy2 rdf:resource="http://d-nb.info/ddc/class/263.91"/>
    <gnd:relatedDdcWithDegreeOfDeterminacy3 rdf:resource="http://d-nb.info/ddc/class/263.912"/>
    <gnd:variantNameForTheSubjectHeading>Vorweihnachtsfest</gnd:variantNameForTheSubjectHeading>
    <gnd:variantNameForTheSubjectHeading>Adventszeit</gnd:variantNameForTheSubjectHeading>
    <gnd:variantNameForTheSubjectHeading>Vorweihnachtszeit</gnd:variantNameForTheSubjectHeading>
    <gnd:preferredNameForTheSubjectHeading>Advent</gnd:preferredNameForTheSubjectHeading>
    <gnd:broaderTermGeneral rdf:resource="http://d-nb.info/gnd/4030726-8"/>
    <gnd:gndSubjectCategory rdf:resource="http://d-nb.info/standards/vocab/gnd/gnd-sc#3.5a"/>
    <rdf:type rdf:resource="http://d-nb.info/standards/elementset/gnd#SubjectHeading"/>
  </rdf:Description>
</rdf:RDF>

```

Kirchenjahr

Liturgik, Frömmigkeit

Co-Occurrence Analysis

„Advent“
<http://de.dbpedia.org/resource/Advent>

The screenshot shows the German Wikipedia page for 'Advent'. The page title is 'Advent' and it includes a navigation bar with options like 'Artikel', 'Diskussion', 'Lesen', 'Bearbeiten', and 'Versionsgeschichte'. The main text explains that 'Advent' (from Latin 'adventus', meaning 'arrival') refers to the period leading up to Christmas, specifically the birth of Jesus. It mentions the 'Adventskalender' (Advent calendar) and 'Adventskranz' (Advent wreath). A table of contents is visible on the right side of the article, listing sections like 'Geschichte', 'Die Adventszeit in der Liturgie', 'Adventstradition', and 'Kommerzialisierung und früher Beginn'. An image of the 'Annunciation' by Robert Campin is also shown, with a caption: 'Der Erzengel Gabriel verkündet der Jungfrau Maria die Ankunft des Herrn. Ölgemälde von Robert Campin, 1420–1440, Brüssel'.

Co-Occurrence Analysis

„Advent“
<http://de.dbpedia.org/resource/Advent>



Adventszeit,
Vorweihnachtszeit,
Vorweihnachtsfest,
Kirchenjahr, Liturgik,
Frömmigkeit

CONTEXT

The screenshot shows the German Wikipedia page for 'Advent'. The page title is 'Advent' and it includes a summary: 'Dieser Artikel beschreibt die Adventszeit. Weitere Bedeutungen siehe unter Advent (Begriffsklärung)'. The main text explains that 'Advent' (from Latin 'adventus', 'Ankunft') is the time leading up to Christmas, during which Christians remember the birth of Jesus and prepare for the 'second coming of Jesus Christ'. It also mentions the Adventist confession and the church year. A table of contents is visible, listing sections like 'Geschichte', 'Die Adventszeit in der Liturgie', 'Adventstradition', 'Adventskalender', 'Adventskranz', 'Lichterbögen', 'Adventslieder (Auswahl)', 'Kommerzialisierung und früher Beginn', 'Weblinks', and 'Einzelnachweise'. There is also a section for 'Geschichte' with a 'Bearbeiten' link. An image of 'Der Erzengel Gabriel verkündet der Jungfrau Maria die Ankunft des Herrn' by Robert Campin is shown on the right.

Co-Occurrence Analysis

„Advent“
<http://de.dbpedia.org/resource/Advent>



Adventszeit,
Vorweihnachtszeit,
Vorweihnachtsfest,
Kirchenjahr, Liturgik,
Frömmigkeit

CONTEXT

$$score_{CA_i} = counter_{cooc_i} \cdot \frac{|W(uri(t)_i) \cap C(t)|}{|C(t)|}$$

The screenshot shows the German Wikipedia page for 'Advent'. The article text includes: 'Advent (lat. *adventus* „Ankunft“), eigentlich *Adventus Domini* (lat. „Ankunft des Herrn“) bezeichnet die Jahreszeit, in der die *Christenheit* sich auf das Hochfest der Geburt Jesu von Nazaret, *Weihnachten*, vorbereitet. Die Christen gedenken der Geburt Jesu und feiern sie als *Menschwerdung Gottes*. Zugleich erinnert der Advent daran, dass Christen das *zweite Kommen Jesu Christi* erwarten sollen. Mit dem ersten *Adventssonntag* beginnt auch das neue *Kirchenjahr*. Zwischen der Konfession der *Adventisten* und der kirchlichen Jahreszeit „Advent“ besteht kein direkter Zusammenhang, sondern eine mittelbare Verbindung, da sich beide Bezeichnungen auf die Ankunft Christi beziehen.'

The article also features an image titled 'Der Erzengel Gabriel verkündet der Jungfrau Maria die Ankunft des Herrn. Ölgemälde von Robert Campin, 1420–1440, Brüssel'.

Mapping Frequency

Labels

Advent

Vorweihnachtszeit

Adventszeit

Vorweihnachtsfest

Mapping Frequency

Labels

Advent

Vorweihnachtszeit

Adventszeit

Vorweihnachtsfest

dbpde:Advent

dbpde:The_Advent

dbpde:Advent,_Cornwall

dbpde:Advent_Creek

dbpde:Advent_Computers

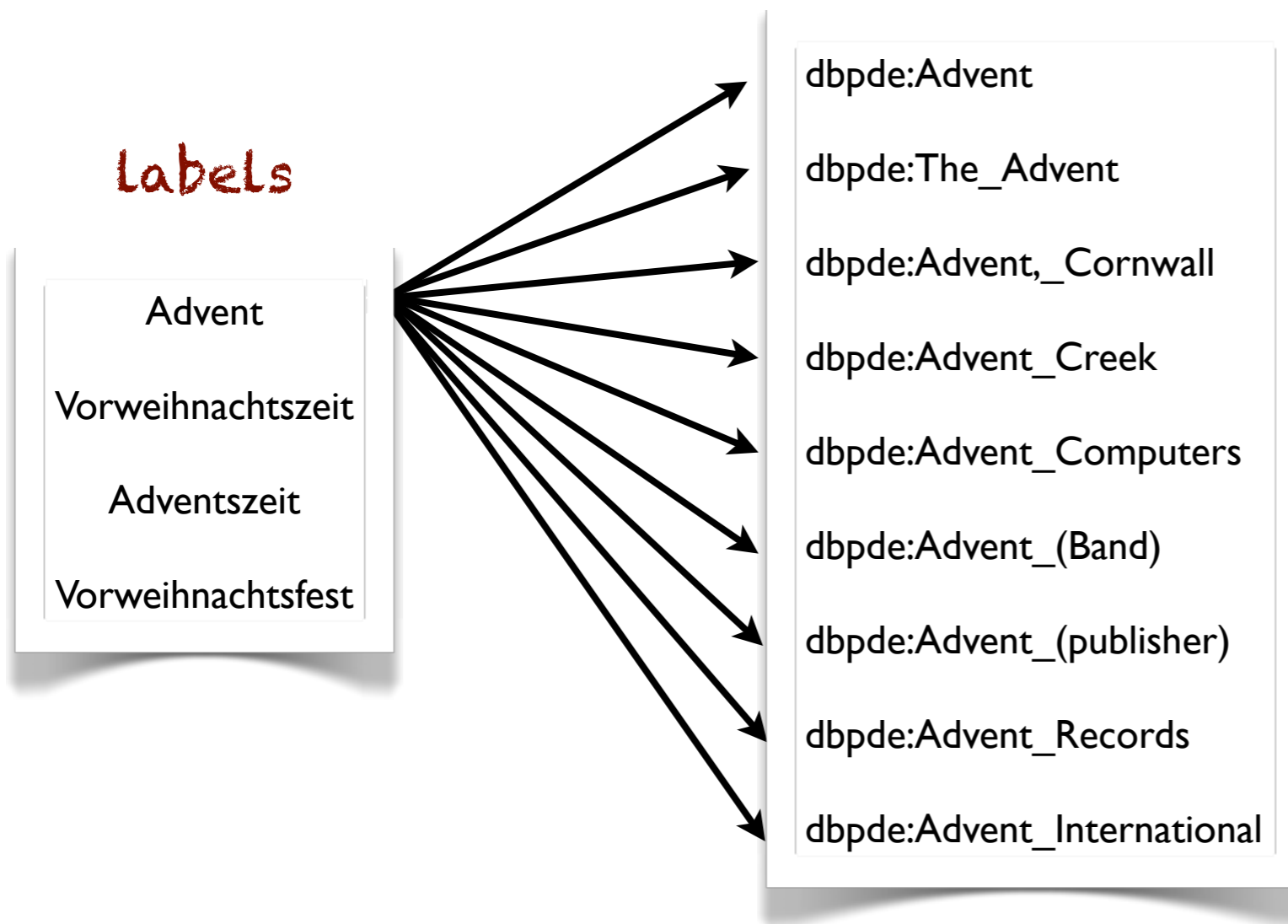
dbpde:Advent_(Band)

dbpde:Advent_(publisher)

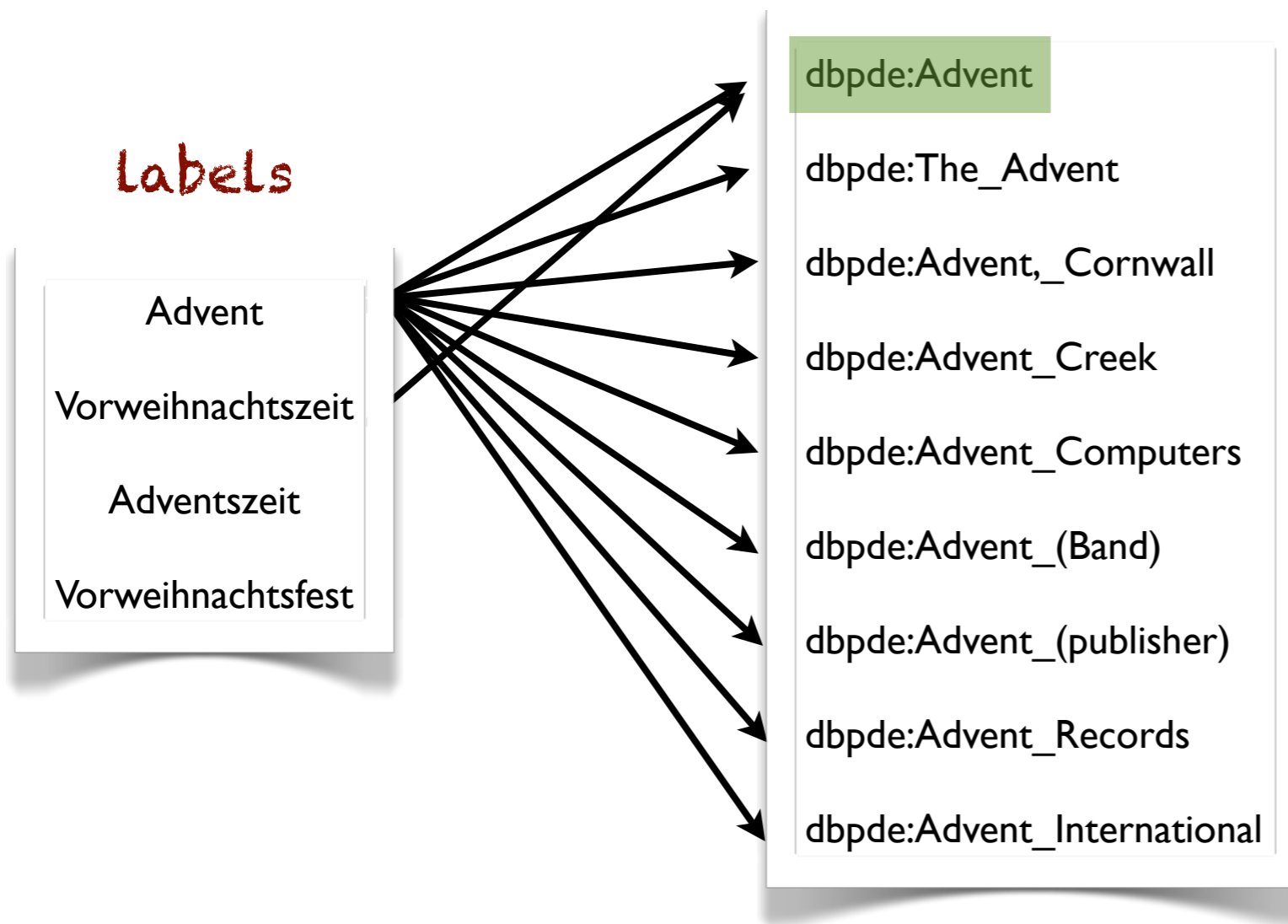
dbpde:Advent_Records

dbpde:Advent_International

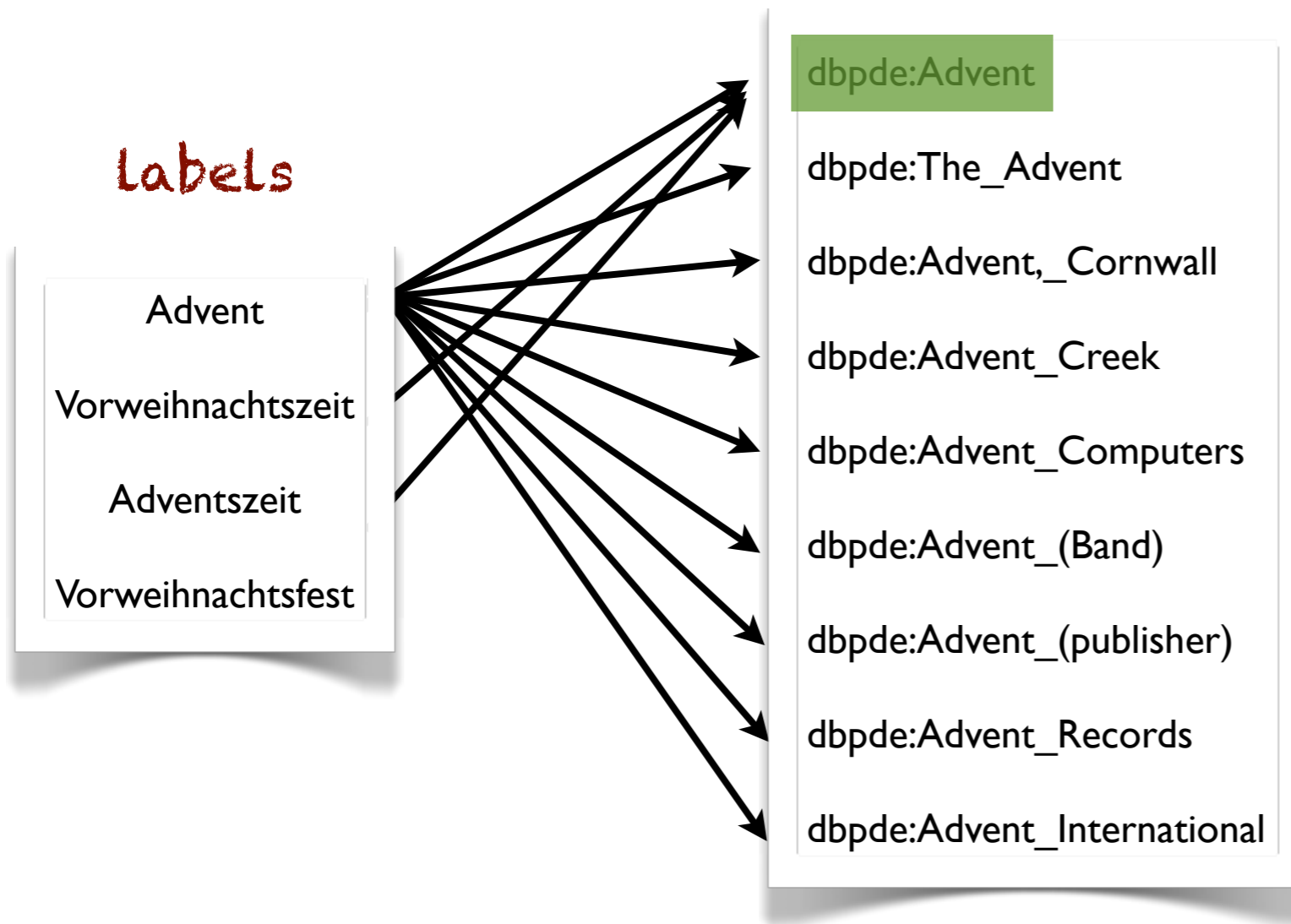
Mapping Frequency



Mapping Frequency



Mapping Frequency



- Mapping benchmark: GND ↔ German Wikipedia
 - ▶ 180 manual mappings
 - ▶ entities of 6 subject areas - information technology, physics, mathematics, chemistry, technology/engineering, architecture

Evaluation and Challenges

- Mapping benchmark: GND ↔ German Wikipedia
 - ▶ 180 manual mappings
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	Recall	Precision
Architecture	0,77	0,80
Chemistry	0,9	0,97
Mathematics	0,94	0,94
Information Technology	0,97	0,97
Physics	0,94	0,94
Technology/Engineering	0,87	0,90
Overall	0,90	0,92

Challenges

- GND contains very specific, or combined entities
 - ▶ „kindergarten building“ - combination of „kindergarten“ and „building“
 - ▶ „Fleischmilchsäure“ - a specific lactic acid, DBpedia only contains „lactid acid“

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- statistics:
 - ▶ 63.356 subject headings for annotation of video archive
 - ▶ 9.616 subject headings used for annotation: 15 %
 - ▶ 245 cannot be mapped to DBpedia: 2,55 %

Thank you for
your attention!

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