

# Documenting the Open Multilingual Wordnet

Francis Bond 

Palacký University  
bond@ieee.org

Michael Wayne Goodman 

LivePerson, Inc.  
goodmami@uw.edu

Ewa Rudnicka 

Wrocław University of Science and Technology  
ewa.rudnicka@pwr.edu.pl

Luis Morgado da Costa 

Vrije Universiteit Amsterdam  
lmorgado.dacosta@gmail.com

Alexandre Rademaker 

Fundação Getulio Vargas & IBM Research  
arademaker@gmail.com

John P. McCrae 

National University of Ireland, Galway  
john@mccr.ae

## Abstract

In this project note we describe our work to make better documentation for the Open Multilingual Wordnet (OMW), a platform integrating many open wordnets. This includes the documentation of the OMW website itself as well as of semantic relations used by the component wordnets. Some of this documentation work was done with the support of the Google Season of Docs. The OMW project page, which links both to the actual OMW server and the documentation has been moved to a new location: <https://omwn.org>.

## 1 Introduction

In this paper we present an ongoing effort to document the Open Multilingual Wordnet (Bond and Foster, 2013), a multilingual platform that currently brings together 33 open, human-curated wordnets.<sup>1</sup> This is possible due to shared links to the Princeton WordNet of English (PWN) (Fellbaum, 1998), which serves as an interlingual interface. OMW's main contributions consist of (i) creating a common format, (ii) building software that allows the display data from a multitude of wordnets, (iii) and encouraging people to choose open licenses. The aligned wordnet data can be

<sup>1</sup>OMW v1.4 had 33 wordnets: English (Fellbaum, 1998); Albanian (Ruci, 2008); Arabic (Sabri et al., 2006); Chinese (Huang et al., 2010; Wang and Bond, 2013); Danish (Pedersen et al., 2009); Dutch (Postma et al., 2016); Finnish (Lindén and Carlson., 2010); French (Sagot and Fišer, 2008); Hebrew (Ordan and Wintner, 2007); Icelandic (Sigmundsson, 1985); Indonesian and Malaysian (Nurril Hirfana et al., 2011); Italian (Pianta et al., 2002); Japanese (Isahara et al., 2008); Norwegian (Bokmål and Nynorsk: Lars Nygaard 2012, p.c.); Persian (Montazery and Faili, 2010); Portuguese (de Paiva and Rademaker, 2012); Polish (Piasecki et al., 2009); Romanian (Tufiş et al., 2008); Swedish (Borin et al., 2013); Thai (Thoongsup et al., 2009) Slovak and Lithuanian (Garabík and Pileckytė, 2013); and Basque, Catalan, Galician and Spanish from the Multilingual Common Repository (Gonzalez-Agirre et al., 2012). OMW v2 adds German (Siegel and Bond, 2021), Kurdish (Aliabadi et al., 2014), Kristang (Morgado da Costa, 2020), Abui (Kratochvil and Morgado da Costa, 2022) and Cantonese (Sio and Morgado Da Costa, 2019).

searched through the OMW webpage.<sup>2</sup> We also offer an extended version of the OMW enriched with the data for 150 languages extracted from Wiktionary<sup>3</sup> and the Unicode Common Locale Data Repository<sup>4</sup> (Bond and Foster, 2013).

The ultimate goal of the OMW is to produce a resource covering as many languages as possible, with as much useful information as possible. Structurally, it is a collection of linked lexicons with a common format and interfaces. From an engineering point of view, we want to proceed in an incremental fashion, at each stage making the resource more useful. Generally, language resources, to be useful, must be both **accessible** (legally usable) and **usable** (of sufficient quality, size and with a documented interface) (Ishida, 2006). These ideas have become widespread through the FAIR data principles (Wilkinson et al., 2016): Findable, Accessible, Interoperable and Reusable. From the start, we have followed these principles: Linking to Open Multilingual Wordnet makes wordnets easy to find. This became even easier when we added the data to the widely used NLTK<sup>5</sup> package. Having a web interface and Python library makes the data accessible. A shared, well-documented format makes the data inter-operable, and versioned releases on a stable platform (GitHub<sup>6</sup>) along with a variety of libraries to access it makes it easily reusable.

Our focus in this paper is the process and progress of creating the OMW documentation (along with the software). Wordnet projects have a long history of excellent documentation, either as MAN pages<sup>7</sup>, as on the Princeton WordNet

<sup>2</sup><https://compling.upol.cz/ntumc/cgi-bin/wn-gridx.cgi?gridmode=grid>

<sup>3</sup><https://www.wiktionary.org/>

<sup>4</sup><https://compling.upol.cz/ntumc/cgi-bin/wn-gridx.cgi?gridmode=gridx>

<sup>5</sup><https://www.nltk.org/>

<sup>6</sup><https://github.com>

<sup>7</sup>A software documentation format originally found on

webpage<sup>8</sup>, or through technical reports (Vossen, 2002) and books (Fellbaum, 1998; Vossen, 1998; Piasecki et al., 2009; Dash et al., 2017). However, once a project has finished, the documentation typically does not get updated, even though the actual wordnets are maintained.

Despite the high quality of some of the wordnet documentation, there are still some major problems. Specifically, the documentation is: (i) inconsistent across projects; (ii) not always up-to-date; (iii) hard to access online and (iv) not integrated with the wordnets or their interfaces. In answer to these challenges, the Global WordNet Association (GWA)<sup>9</sup> set up a Working Group on Documentation, which includes the first five authors of this paper.<sup>10</sup> In Section 2 we discuss these issues, and then in Section 3 we outline our solutions. We link to the online documentation and interface at <https://omwn.org>.

## 2 Problems

In the next section we discuss the problems in more detail, giving examples.

### 2.1 Inconsistency Across Projects

Often projects call the same relation by different names. The Princeton WordNet labels the relation between a word and its supertype as **hypernym** for nouns and **troponym** for verbs. However, if we consider two synsets *A* and *B* linked by **hypernym** (*A hypernym B*) it is not clear which is which. Should this be read as “A is the hypernym of B” or “A has hypernym B”? EuroWordnet makes this clear by calling the equivalent relationship **has\_hyponym**: *A has\_hyponym B* is not ambiguous. But if we want to use data from different projects, we must be able to determine that **hypernym** and **has\_hyponym** are the same.

Another example is in the abbreviations for parts of speech (POS). Princeton WordNet uses **n** for **noun**, **v** for **verb**, **a** for **adjective** and **r** for **adverb**. The Slovenian wordnet (Fišer et al., 2012) uses a different POS for adverb: **b** (**adverb**), as this is the default for the tool they use (DEBVisDic: Horák et al., 2006). If you just download the individual

wordnets, it is not immediately clear that **r** and **b** refer to the same thing.

### 2.2 Outdated Content

Another big issue with documentation is that, as projects progress, new information is added (and sometimes removed) and the documentation does not always reflect this. Online documentation has its own issues, with linkrot being a real problem: in academic literature the half life of a link is typically not much longer than four years (Lawrence et al., 2001). A related problem for wordnets is that it is not always clear where the newest version of a wordnet can be found, especially if the new version is being prepared by a new group. The *Wordnets in the World* page<sup>11</sup> is a page listing wordnet projects, maintained by the GWA. This goes some way toward improving this, but it is only sporadically updated. It currently lacks, for example, any mention of the Open English Wordnet (McCrae et al., 2019).

Even outdated documentation is better than no documentation (Lethbridge et al., 2003), but it is, of course, better to keep documentation up-to-date.

### 2.3 Inaccessible Online

Print books have many advantages: many people find them less fatiguing to read, and reading a print book versus an e-book appears to boost reading comprehension, although improved screen quality may alleviate this (Jeong, 2012). However, they can be expensive and hard to access. Further, they are not searchable or hyperlinkable. For documentation, accessibility is extremely important.

Documentation updates are often informally given in academic papers, the recent archiving of Global WordNet Conference papers on the ACL Anthology (Gildea et al., 2018) has made wordnet papers much more accessible, which is a great boon.

### 2.4 Stand alone

Finally, one potential advantage of having documentation online is linking it directly to the wordnets themselves for examples. Another potential advantage is linking specialist terms in the wordnet interfaces to the documentation.

Linking to wordnets allows examples to be given in different languages, makes sure the examples are up-to-date, and allows browsing. The disadvantage

Unix systems.

<sup>8</sup><https://wordnet.princeton.edu/documentation>

<sup>9</sup><http://globalwordnet.org/>

<sup>10</sup><http://globalwordnet.org/resources/working-groups/>, <https://globalwordnet.github.io/gwadoc/group.html>

<sup>11</sup><http://globalwordnet.org/resources/wordnets-in-the-world/>

is that if the wordnet used for the example goes offline for some reason, then the examples will not be available.

Linking the wordnet interfaces to the documentation improves usability both for casual users, who may not know specialist terms, and expert users, who may want to see links to more detailed documentation and further references.

### 3 Shared Documentation

Our solution to the above problems relies on two new initiatives. Both are hosted on GitHub, a well-funded site with a good open source track record. GitHub hosts code and other projects using the version control system Git, and it also serves static webpages for these projects. GitHub is backed up by the internet archive, as well as having snapshots stored in the Arctic Code Vault,<sup>12</sup> so the data is well-preserved. The URLs should also last for the foreseeable future, thus guarding against linkrot.

The general documentation is supported by the Global Wordnet Association Documentation Working Group: having a group responsible rather than an individual project makes it more likely to be kept up-to-date, and having contributors from multiple projects makes sure attention is paid to consistency across different projects. Further, the GitHub infrastructure for raising issues and discussing them lowers the cost to keeping the documentation up-to-date. The actual task of writing the documentation requires considerable investment of time, and so for 2020 we applied for and received support from the Google Season of Docs.<sup>13</sup> Three technical writers helped contribute documentation for the wordnet structure, primarily semantic relations, and the Open Multilingual Wordnet interface.

#### 3.1 Documenting the Semantic Relations: GWADOC

To document semantic relations, we made a Python package that can be used to provide (i) user-facing documentation of things like relations and parts of speech used by wordnets and (ii) a Python API for querying this documentation, such as for retrieving the localized name or definition for specific relations. This is available at <https://globalwordnet.github.io/gwadoc/>.

<sup>12</sup><https://github.blog/2020-07-16-github-archive-program-the-journey-of-the-worlds-open-source-code-to-the-arctic/>

<sup>13</sup><https://developers.google.com/season-of-docs/docs/2020/participants/>

We give screenshots of the user facing documentation in Figures 1 and 2. The documentation starts with a non-specialist friendly definition followed by a summary of properties and a short example. It then gives a longer definition, some examples, tests, comments, shows how the relation would be defined in the Global Wordnet Association LMF format (McCrae et al., 2021) and links to names in other projects.

The interface is reactive, changing to fit different screen sizes and hyperlinks to examples and documentation.

We give an example of using the Python API in Figure 3. You can set the language to one of the languages for which we have documentation (currently English, Japanese and Polish). Note that when information is missing in any particular language, it seamlessly backs off to giving the English documentation.

All semantic relations from the latest release (version 1.2) of the Global Wordnet Association LMF format<sup>14</sup> are documented. Our long-term goal is to keep this documentation in sync with the schemas.

#### 3.2 Documenting the Open Multilingual Wordnet

The Open Multilingual Wordnet is available here: <https://omwn.org>. We give an example of the documentation of the OMW in Figure 4. It shows how the semantic documentation from Section 3.1 is used to provide a mouseover tooltip when semantic relations are shown in the interface. Clicking the relation name sends you to the full documentation of the relation as shown in Figure 1.

The documentation includes information about the wordnets' structure, the OMW interface, and the documentation itself.

- OMW Wordnet Structure
  - Semantic Relations (as described above)
  - Parts of Speech
  - Definitions and Examples
  - Orthographic Variants
  - Glossary of Terms
- OMW Interface Documentation
  - Searching for words or concepts
  - Get Involved! Contribute to OMW

<sup>14</sup><https://globalwordnet.github.io/schemas/>

Constitutive

- o Hyponym ↔ Hypernym
  - Feminine ↔ Has
    - Feminine
    - Masculine ↔ Has
      - Masculine
  - Young ↔ Has Young
- o Instance Hyponym ↔ Instance Hypernym
- o Antonym
  - Gradable Antonym
  - Simple Antonym
  - Converse Antonym
- o Equal Synonym
  - Inter-register Synonym
- o Similar
- o Meronym ↔ Holonym
  - Location Meronym ↔ Location Holonym
  - Member Meronym ↔ Member Holonym
  - Part Meronym ↔ Part Holonym
    - Portion Meronym ↔ Portion Holonym
    - Substance Meronym ↔ Substance Holonym

Other

- Domain ↔ In Domain
- Role ↔ Involved
- Participle
- Pertainym
- Derivation

## Hyponym (hyponym)

"a concept that is more specific than a given concept"

**symbol**     ⊂

**applicability**     synset-synset

**reverse**     [hyponym](#)

**example**     [dog](#) is a hyponym of [animal](#)

### Definition

A hyponym of something is its subtype: if A is a hyponym of B, then all A are B.

### Examples

[beef](#) is a hyponym of [meat](#)

[pear](#) is a hyponym of [edible fruit](#)

[dictionary](#) is a hyponym of [wordbook](#)

### Tests

**Test:**

- Hyponymy-relation between nouns (EWN test 9)

yes	a	A/an	A is a/an B with certain properties
.	.		It is a A and therefore also a B
.	.		If it is a A then it must be a B
no	b		the converse of any of the (a) sentences.

**Conditions:**

- both A and B are singular nouns or plural nouns.

Figure 1: User Facing Documentation for Hyponym (1)

Constitutive

- o Hyponym ↔ Hypernym
  - Feminine ↔ Has
    - Feminine
    - Masculine ↔ Has
      - Masculine
  - Young ↔ Has Young
- o Instance Hyponym ↔ Instance Hypernym
- o Antonym
  - Gradable Antonym
  - Simple Antonym
  - Converse Antonym
- o Equal Synonym
  - Inter-register Synonym
- o Similar
- o Meronym ↔ Holonym
  - Location Meronym ↔ Location Holonym
  - Member Meronym ↔ Member Holonym
  - Part Meronym ↔ Part Holonym
    - Portion Meronym ↔ Portion Holonym
    - Substance Meronym ↔ Substance Holonym

Other

- Domain ↔ In Domain
- Role ↔ Involved
- Participle
- Pertainym
- Derivation

**Test:**

- Hyperonymy/hyponymy between verb synsets (EWN test 11)

yes	a	to A is to B + AdvP/AdjP/NP/PP
no	b	to B is to A + AdvP/AdjP/NP/PP

**Conditions:**

- A is a verb in the infinitive form
- B is a verb in the infinitive form
- there is at least one specifying AdvP, NP or PP that applies to the B-phrase.

### Comments

This is the fundamental relation, generally used for nouns and verbs. In pIWordNet it is also extended to adjectives and adverbs.

### XML

In the [XML format for Wordnet LMF](#) the relation should be shown like this:

```

<Synset id="wn-synset-A" ili="iXYZ" partOfSpeech="x">
  <SynsetRelation relType="hyponym"
    target="wn-synset-B"/>
</Synset>

```

### Project-specific Names

<b>Princeton WordNet Relation Name</b>	hyponym
<b>Princeton WordNet Pointer</b>	~
<b>Euro WordNet Relation Name</b>	has_hyponym
<b>PIWordNet Relation Name</b>	hiponimia
<b>PERL WordNet-QueryData Module</b>	hypo
<b>Open Multilingual Wordnet Concept</b>	⟨⟨i69570⟩⟩

Figure 2: User Facing Documentation for Hyponym (2)

```

>>> import gwadoc
>>> for relname in gwadoc.RELATIONS[:5]:
...     print(relname, '\n    ', gwadoc.relations[relname].df.en)
...
constitutive
    Core semantic relations that define synsets
hyponym
    a word that is more specific than a given word
hypernym
    a word that is more general than a given word
instance_hyponym
    an occurrence of something
instance_hypernym
    the type of an instance

### Change default language
>>> gwadoc.set_preferred_language('ja')
>>>
>>> for relname in gwadoc.RELATIONS[:5]:
...     print(f"""\{relname} (\{gwadoc.relations[relname].name})
...         \{gwadoc.relations[relname].df}""")
...
constitutive (Constitutive)
    Core semantic relations that define synsets
hyponym (下位語)
    当該synsetが相手synsetを包含する
hypernym (上位語)
    a word that is more general than a given word
instance_hyponym (事例)
    当該synsetは相手synsetの事例である
instance_hypernym (事例あり)
    当該synsetは相手synsetを事例として持つ

```

Figure 3: GWADOC Python Example

- Uploading a wordnet (an LMF-formatted file)
  - The structure of the LMF file
  - A script for converting the simple tab-separated format used in OMW 1.0 to WN-LMF (external tool)
  - Interconverter for desired formats (external tool)
  - More information about the LMF metadata
  - A script for uploading wordnets from the command line
  - Documentation on the feedback after uploading a wordnet
  - A summary of the wordnets in OMW
  - Information about reporting an issue and giving feedback
- OMW documentation on documentation style guides, useful macros and more

## 4 Future Work

In future work, we would like to add more languages to the documentation, and encourage its use in more projects. We strongly encourage more people to contribute to the documentation.

At least some of the documentation of wordnet structure should probably be moved to the GWA documentation project, rather than being tied to the OMW. For example, the documentation on parts of speech, sense relations, the glossary and so forth.

We will also move the *Wordnets in the World* and *WordNet Annotated Corpora* pages to the GitHub site to make it easier for people to add new resources.

## 5 Conclusions

In this project note we described an ongoing push to make better documentation for wordnets available online, through the documentation of the Open Multilingual Wordnet (OMW). This includes the documentation of the OMW website itself and the semantic relations. Some of this was done as

**Basic Search Function:**

The Basic Search function is used to search lemmas, which is present on the head of the concept page. A lemma is a word you find in the dictionary or wordnet. In the search function, there are two language select options. You can select the languages in which you want to search the word in the search bar. For example, if you choose English & French, and then if you search for a word, it will search that word in both languages.

**Glob Patterns:**

Glob patterns are used for file path expansion with the help of wildcard characters. [See the OMW documentation on Glob.](#)

- [Learn how to use the SQLite GLOB operator to determine whether a string matches a specific pattern.](#)

**Hints (tooltips):**

Many elements have short explanations that will be shown if you hover over them. If you click on them, they will lead you to more detailed information. For example, if you want to know what hypernym means, you can hover your pointer over hypernym.

**Elements of a Concept:**

Figure 4: OMW Search Documentation

part of the Google Season of Docs. We sketched some ways we want to improve this even further in the future.

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