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A Corpus of Preposition Supersenses

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Abstract

We present the first corpus annotated with preposition supersenses, unlexicalized categories for semantic functions that can be marked by English prepositions (Schneider et al., 2015). The preposition supersenses are organized hierarchically and designed to facilitate comprehensive manual annotation. Our dataset is publicly released on the web.

1 Introduction

English prepositions exhibit stunning frequency and wicked polysemy. In the 450M-word COCA corpus (Davies, 2010), 11 prepositions are more frequent than the most frequent noun. In the corpus presented in this paper, prepositions account for 8.5% of tokens (the top 11 prepositions comprise >6% of all tokens). Far from being vacuous grammatical formalities, prepositions serve as essential linkers of meaning, and the few extremely frequent ones are exploited for many different functions (figure 1). For all their importance, however, prepositions have received relatively little attention in computational semantics, and the community has not yet arrived at a comprehensive and reliable scheme for annotating the semantics of prepositions in context (§2). We believe that such annotation of preposition functions is needed if preposition sense disambiguation systems are to be useful for downstream tasks—e.g., translation or semantic parsing (cf. Dahlmeier et al., 2009; Srikumar and Roth, 2011).

This paper describes a new corpus, fully annotated with preposition supersenses (hierarchically organized unlexicalized classes primarily reflecting thematic roles; Schneider et al., 2015). Whereas fine-grained sense annotation for individual prepositions is difficult and limited by the coverage and quality of a lexicon, preposition supersense annotation offers a practical alternative (§2). We comprehensively annotate English preposition tokens in a corpus of web reviews (§3). It is the first English corpus with semantic annotations of prepositions that are both comprehensive (describing all preposition types and tokens) and double-annotated (to attenuate subjectivity in the annotation scheme and measure inter-annotator agreement). The corpus gives us an empirical distribution of preposition supersenses, and the annotation process has helped us improve upon the supersense hierarchy. Additionally, we examine the correspondences between our annotations and role labels from PropBank (§4). For some labels, clean correspondences between the two independent annotations speak to the validity of our hierarchy and annotation, but this analysis also reveals mismatches deserving of further examination. The corpus is publicly released (footnote 1).

Figure 1: Preposition supersenses illustrating the polysemy of to and for. Both can mark a DESTINATION or PURPOSE, while there are other functions that do not overlap. The syntactic complement use of infinitival to is tagged as i. The over token in (1) receives the label APPROXIMATOR. See §3.1 for details.

STREUSLE 3.0, available at http://www.cs.cmu.edu/~ark/LexSem/
http://www.wordfrequency.info/free.asp?s=y
This work focuses on English, but adposition and case systems vary considerably across languages, challenging second language learners and machine translation systems (Chodorow et al., 2007; Shilon et al., 2012; Hashemi and Hwa, 2014).
Brugman, 1981; Lakoff, 1987; Tyler and Evans, 2003; O’Dowd, 1998; Saint-Dizier and Ide, 2006; Lindstromberg, 2010). Prepositional polysemy has also been recognized as a challenge for AI (Hershkovits, 1986) and natural language processing, motivating semantic disambiguation systems (O’Hara and Wiebe, 2003; Ye and Baldwin, 2007; Hovy et al., 2010; Srikumar and Roth, 2013b). Training and evaluating these requires semantically annotated corpus data. Below, we comment briefly on existing resources and why (in our view) a new resource is needed to “road-test” an alternative, hopefully more scalable, semantic representation for prepositions.

### 2.1 Existing Preposition Corpora

Beginning with the seminal resources from The Preposition Project (TPP; Litkowski and Hargraves, 2005), the computational study of preposition semantics has been fundamentally grounded in corpus-based lexicography centered around individual preposition types. Most previous datasets of English preposition semantics at the token level (Litkowski and Hargraves, 2005, 2007; Dahlmeier et al., 2009; Tratz and Hovy, 2009; Srikumar and Roth, 2013a) only cover high-frequency prepositions (the 34 represented in the SemEval-2007 shared task based on TPP, or a subset thereof).

We sought a scheme that would facilitate comprehensive semantic annotation of all preposition tokens in a corpus, covering the full range of usages possible for all English preposition types. The recent TPP PDEP corpus (Litkowski, 2014, 2015) comes closer to this goal, as it consists of randomly sampled tokens for over 300 types. However, since sentences were sampled separately for each preposition, there is only one annotated preposition token per sentence. By contrast, we will fully annotate documents for all preposition tokens. No inter-annotator agreement figures have been reported for the PDEP data to indicate its quality, or the overall difficulty of token annotation with TPP senses across a broad range of prepositions.

### 2.2 Supersenses

From the literature on other kinds of supersenses, there is reason to believe that token annotation with

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*A further limitation of the SemEval-2007 dataset is the way in which it was sampled: illustrative tokens from a corpus were manually selected by a lexicographer. As Litkowski (2014) showed, a disambiguation system trained on this dataset will therefore be biased and perform poorly on an ecologically valid sample of tokens.*

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*preposition supersenses* (Schneider et al., 2015) will be more scalable and useful than senses. The term *supersense* has been applied to lexical semantic classes that label a large number of word types (i.e., they are unlexicalized). The best-known supersense scheme draws on two inventories—one for nouns and one for verbs—which originated as a high-level partitioning of senses in WordNet (Miller et al., 1990). A scheme for adjectives has been proposed as well (Tsvetkov et al., 2014).

One argument advanced in favor of supersenses is that they provide a coarse level of generalization for essential contextual distinctions—such as artifact vs. person for chair, or temporal vs. locative in—without being so fine-grained that systems cannot learn them (Ciaramita and Altun, 2006). A similar argument applies for human learning as pertains to rapid, cost-effective, and open-vocabulary annotation of corpora: an inventory of dozens of categories (with mnemonic names) can be learned and applied to unlimited vocabulary without having to refer to dictionary definitions (Schneider et al., 2012). Like with WordNet for nouns and verbs, the same argument holds for prepositions: TPP-style sense annotation requires familiarity with a different set of (often highly nuanced) distinctions for each preposition type. For example, in has 15 different TPP senses, among them in **10(7a)** ‘indicating the key in which a piece of music is written: *Mozart’s Piano Concerto in E flat*’.

Supersenses have been exploited for a variety of tasks (e.g., Agirre et al., 2008; Tsvetkov et al., 2013, 2015), and full-sentence noun and verb taggers have been built for several languages (Segond et al., 1997; Johannsen et al., 2014; Picca et al., 2008; Martínez Alonso et al., 2015; Schneider et al., 2013, 2016). They are typically implemented as sequence taggers. In the present work, we extend a corpus that has already been hand-annotated with noun and verb supersenses, thus raising the possibility of systems that can learn all three kinds of supersenses jointly (cf. Srikumar and Roth, 2011).

Though they go by other names, the TPP “classes” (Litkowski, 2015), the “clusters” of Tratz and Hovy (2011), and the “relations” of Srikumar and Roth (2013a) similarly label coarse-grained semantic functions of English prepositions; notably, they group senses from a lexicon rather than directly annotating tokens, and restrict each sense

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*http://www.clres.com/db/classes/ClassAnalysis.php*
Figure 2: Supersense hierarchy used in this work (adapted from Schneider et al., 2015). Circled nodes are roots (the most abstract categories); subcategories are shown above and below. Each node’s color and formatting reflect its depth.

to (at most) 1 grouping. Schneider et al. (2015) used the Srikumar and Roth (2013a) “relation” categories as a starting point in creating the preposition supersense inventory, but removed the assumption that each TPP sense could only belong to 1 category. Müller et al.’s (2012) semantic class inventory targets German prepositions.

2.3 PrepWiki

Schneider et al.’s (2015) preposition supersense scheme is described in detail in a lexical resource, PrepWiki, which records associations between supersenses and preposition types. Hereafter, we adopt the term usage for a pairing of a preposition type and a supersense label (e.g., at/TIME). Usages are organized in PrepWiki via (lexicalized) senses from the TPP lexicon. The mapping is many-to-many, as senses and supersenses capture different generalizations. (TPP senses, being lexicalized, are more numerous and generally finer-grained, but in some cases lump together functions that receive different supersenses, as in the sense for 2(2) ‘affecting, with regard to, or in respect of’.) Thus, for a given preposition, a sense may be mapped to multiple usages, and vice versa.

2.4 The Supersense Hierarchy

Unlike the noun, verb, and adjective supersense schemes mentioned in §2.2, the preposition supersense inventory is hierarchical (as are Litkowski’s (2015) and Müller et al.’s (2012) inventories). The hierarchy, depicted in figure 2, encodes inheritance: characteristics of higher-level categories are asserted to apply to their descendants. Multiple inheritance is used for cases of overlap: e.g., DESTINATION inherits from both LOCATION (because a destination is a point in physical space) and GOAL (it is the endpoint of a concrete or abstract path).

The structure of the hierarchy was modeled after VerbNet’s hierarchy of thematic roles (Bonial et al., 2011; Hwang, 2014). But there are many additional categories: some are refinements of the VerbNet roles (e.g., subclasses of TIME), while others have no VerbNet counterpart because they do not pertain to core roles of verbs. The CONFIGURATION sub-hierarchy, used for of and other prepositions when they relate two nominals, is a good example.

The hierarchical structure will be useful for comparing against other annotation schemes which operate at different levels of granularity, as we do in §4 below. We expect that it will also help supervised classifiers to learn better generalizations when faced with sparse training data.

3 Corpus Annotation

3.1 Annotating Preposition Supersenses

Source data. We fully annotated the REVIEWS section of the English Web Treebank (Bies et al., 2012), chosen because it had previously been annotated for multiword expressions, noun and verb supersenses (Schneider et al., 2014; Schneider and Smith, 2015), and PropBank predicate-argument structures (§4). The corpus comprises 55,579 tokens organized into 3,812 sentences and 723 documents with gold tokenization and PTB-style POS
Identifying preposition tokens. TPP, and therefore PrepWiki, contains senses for canonical prepositions, i.e., those used transitively in the [pp P NP] construction. Taking inspiration from Pullum and Huddleston (2002), PrepWiki further assigns supersenses to spatiotemporal particle uses of out, up, away, together, etc., and subordinating uses of as, after, in, with, etc. (including infinitival to and infinitival-subject for, as in It took over 1.5 hours for our food to come out).

Non-supersense labels. These are used where the preposition serves a special syntactic function not captured by the supersense inventory. The most frequent is ‘i, which applies only to infinitival to tokens that are not PURPOSE or FUNCTION adjuncts. The label ‘d applies to discourse expressions like On the other hand; the unqualified backtick (‘) applies to miscellaneous cases such as infinitival-subject for and both prepositions in the as-as comparative construction (as wet as water; as much cake as you want).

Multiword expressions. Figure 3 shows how prepositions can interact with multiword expressions (MWEs). An MWE may function holistically as a preposition: PrepWiki treats these as multiword prepositions. An idiomatic phrase may be headed by a preposition, in which case we assign it a preposition supersense or tag it as a discourse expression (‘d: see the previous paragraph). Finally, a preposition may be embedded within an MWE (but not its head): we do not use a preposition supersense in this case, though the MWE as a whole may already be tagged with a verb supersense.

Heuristics. The annotation tool uses heuristics to detect candidate preposition tokens in each sentence given its POS tagging and MWE annotation. A single-word expression is included if: (a) it is tagged as a verb particle (RP) or infinitival to (TO), or (b) it is tagged as a transitive preposition or

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7PrepWiki does not include subordinators/complementizers that cannot take NP complements: that, because, while, if, etc.

8Because the word to is ambiguous between infinitival and prepositional usages, and because infinitivals, like PPs, can serve as PURPOSE or FUNCTION modifiers, we allow infinitival to to be so marked. E.g., a shoulder to cry on would qualify as FUNCTION. By contrast, I want/love/try to eat cookies and To love is to suffer would qualify as ‘i. See figure 1 for examples from the corpus.

9Annotators used additional non-supersense labels to mark tokens that were incorrectly flagged as prepositions by our heuristics: e.g., price was way to high was marked as an adverb. We ignore these tokens for purposes of this paper.
Figure 4: Supersense annotation interface, developed in-house. The main thing to note is that preposition, noun, and verb supersenses are stored in text boxes below the sentence. A dropdown menu displays the full list of preposition supersenses, starting with those with PrepWiki mappings to the preposition in question. Hovering the mouse over a menu item displays a tooltip with PrepWiki examples of the usage (if applicable) and a general definition of the supersense.

There were two expert annotators, both authors of this paper.

Training. 200 sentences were set aside for training annotators. Annotators were first shown how to use the preposition annotation tool and instructed on the supersense distinctions for this task. Annotators then completed a training set of 100 sentences. An adjudicator evaluated the annotator’s annotations, providing feedback and assigning another 50–100 training instances if necessary.

Inter-annotator agreement (IAA) measures are useful in quantifying annotation “reliability”, i.e., indicating how trustworthy and reproducible the process is (given guidelines, training, tools, etc.). Specifically, IAA scores can be used as a diagnostic for the reliability of (i) individual annotators (to identify those who need additional training/guidance); (ii) the annotation scheme and guidelines (to identify problematic phenomena requiring further documentation or changes to the scheme); (iii) the final dataset (as an indicator of what could reasonably be expected of an automatic system).

Individual annotators. The main annotation was divided into 34 batches of 100 sentences. Each batch took on the order of an hour for an annotator to complete. We monitored original annotators’ IAA throughout the annotation process as a diagnostic for when to intervene in giving further guidance. Original IAA for most of these batches fell between 60% and 78%, depending on factors such as the identities of the annotators and when the annotation took place (annotator experience and PrepWiki documentation improved over time). These rates show that it was not an easy annotation task, though many of the disagreements were over slight distinctions in the hierarchy (such as **Purpose** vs. **Function**).

Guidelines. Though Schneider et al. (2015) conducted pilot annotation in constructing the supersense inventory, our annotators found a few details of the scheme to be confusing. Informed by their difficulties and disagreements, we therefore made several minor improvements to the preposition supersense categories and hierarchy structure. For example, the supersense categories for partitive constructions proved persistently problematic, so we adjusted their boundaries and names. We also improved the high-level organization of the original hierarchy, clarified some supersense descriptions, and removed the miscellaneous **Other** supersense.

Revisions. The changes to categories/guidelines noted in the previous paragraph required a small-scale post hoc revision to the annotations by the expert annotators. Some additional post hoc revisions were performed to improve consistency, e.g., some anomalous multiword expression annotations
4,250 tokens in the corpus have preposition super-
senses. 144 prepositions and 63 supersenses are
attested. Their distributions appear in figure 5. 
Over 75% of tokens belong to the top 10 prepo-
sition types, while the supersense distribution is
closer to uniform. 1,170 tokens are labeled as LO-
CATION, PATH, or a subtype thereof: these can
roughly be described as spatial. 528 come from the
TEMPORAL subtree of the hierarchy, and 452 from
the CONFIGURATION subtree. Thus, fully
half the tokens (2,100) mark non-spatiotemporal
participants and circumstances.

Of the 4,250 tokens, 582 are MWEs (multiword
prepositions and/or PP idioms). A further 588
preposition tokens (not included in the 4,250) have
non-supersense labels: 484 ‘i, 83 ‘d, and 21 ‘.

3.4 Splits
To facilitate future experimentation on a standard
benchmark, we partitioned our data into training
and test sets. We randomly sampled 447 sentences
(4,073 total tokens and 950 (19.6%) preposition
instances) for a held-out test set, leaving 3,888 prepo-
sition instances for training.15 The sampling was
stratified by preposition supersense to encourage a
reasonable balance for the rare labels; e.g., super-
senses that occur twice are split so that one instance
is assigned to the training set and one to the test
set.16 61 preposition supersenses are attested in the
training data, while 14 are unattested.

4 Inter-annotation Evaluation with
PropBank
The REVIEWS corpus that we annotated with
preposition supersenses had been independently

11In particular, many of the borderline prepositional
verbs were revised according to the guidelines out-
lined at https://github.com/nschneid/nanni/wiki/
Prepositional-Verb-Annotation-Guidelines.
12These sentences were then jointly adjudicated by the ex-
erts to arrive at a final version.
13For completeness, Cohen’s $\kappa$ = .878. It is almost as high
as raw agreement because the expected agreement rate is very
low, but keep in mind that $\kappa$’s model of chance agreement
does not take into account preposition types or the fact that, for
a given type, a relatively small subset of labels were suggested to
the annotator. On the 4 most frequent prepositions in the
sample, per-preposition $\kappa$ is .84 for for, 1.0 for to, .59 for of,
and .73 for in.
14For the purpose of counting prepositions by type, we
split up supersense-tagged PP idioms such as those shown in
(5) and (6) by taking the longest prefix of words that has a
PrepWiki entry to be the preposition.

15These figures include tokens with non-supersense labels
(§3.1); the supersense-labeled prepositions amount to 3,397
training and 853 test instances.
16The sampling algorithm considered supersenses in
increasing order of frequency: for each supersense $\ell$ having $n_{\ell}$
instances, enough sentences were assigned to the test set to fill
a minimum quota of $\lceil 0.15n_{\ell} \rceil$ tokens for that supersense (and
remaining unassigned sentences containing that supersense
were placed in the training set). Relative to the training set,
the test set is skewed slightly in favor of rarer supersenses. A
small number of annotation errors were corrected after deter-
mining the splits. Entire sentences were sampled to facilitate
future studies involving joint prediction over the full sentence.

Figure 5: Distributions of preposition types
and supersenses for the 4,250 supersense-
tagged preposition tokens in the corpus. Ob-
serve that just 9 prepositions account for 75%
of tokens, whereas the head of the supersense
distribution is much smaller.
annotated with PropBank (Palmer et al., 2005; Bonial et al., 2014) predicate-argument structures. As a majority of preposition usages mark a semantic role, this affords us the opportunity to empirically compare the two annotation schemes as applied to the dataset—assessing not just inter-annotator agreement, but also inter-annotation agreement. (Our annotators did not have access to the PropBank annotations.) Others have conducted similar token-level analyses to compare different semantic representations (e.g., Fellbaum and Baker, 2013).

The supersense inventory is finer-grained than the PropBank function tags, ruling out a one-to-one correspondence. However, if the two sets of categories are both linguistically valid and correctly applied, then we expect that a label from either scheme will be predictive of the other scheme’s label(s). Thus, we investigate the kinds and causes of divergence to see whether they reveal theoretical or practical problems with either scheme.

4.1 Function Tags in PropBank

In comparing our supersense annotation to the PropBank annotation of prepositional phrases, we focus on the mapping of the supersenses to PropBank’s function tags marking location (LOC), extent (EXT), cause (CAU), temporal (TMP), and manner (MNR), among others.

Originally associated with modifier (ARGM) labels, function tags were recently added to all PropBank numbered arguments in an effort to address the performance problems in SRL systems caused by the higher-numbered arguments (Bonial et al., 2016).\(^\text{17}\) In addition to the 13 existing function tags, three tags were introduced specifically for numbered roles: Proto-Agent (PAG), Proto-Patient (PPT), and Verb-Specific (VSP). These three tags are used, respectively, for Arg0, Arg1, and other arguments that simply do not have an appropriate function tag because they are unique to the lemma in question. Each of the numbered arguments has thus been annotated with a function tag. Unlike modifiers, where the function tag is annotated at the token level, function tags on the numbered arguments were assigned at the type level (in verbs’ frameset definitions) by selecting the function tag most applicable to existing annotations.

Example (8) shows a sentence annotated for the predicate going; function tags appear in each argu-

\(^{17}\)While automatic SRL performance is quite good for the detection of Arg0 and Arg1, the performance on identification of higher-numbered arguments, 2–6, is relatively poor due to the variety of semantic roles they are associated with, depending on which relation is being considered.
4.2 Supersense and PropBank function tag correspondence

Figures 6 and 7 show the distribution of correspondences between the PropBank function tags and the supersense labels. Figure 6 visualizes all the mapped tokens, organized by function tag; figure 7 visualizes the function tag distributions for the most frequent supersenses that could be mapped.

Modifiers. We find that the supersense hierarchy captures some of the same generalizations as PropBank’s coarser-grained distinctions. Most notably, the PropBank ArgM labels (visualized in the right-hand sides of figures 6 and 7) correspond relatively cleanly to the supersense labels: PropBank’s TMP maps exclusively to the TEMPORAL branch of the hierarchy; and PRP, CAU, and to a slightly lesser extent LOC, map cleanly to their supersense counterparts PURPOSE, EXPLANATION, and LOCUS (and its subcategory LOCATION). The supersenses ATTRIBUTE, CIRCUMSTANCE, MANNER and the function tags ADV, MNR, PRD, and GOL stand out as warranting further scrutiny as applied to ArgMs.

Numbered arguments. The situation for numbered arguments is considerably messier. Note, for example, that in the left portion of figure 7, only a few of the supersenses map consistently to a single function tag: DESTINATION and RECIPIENT to GOL, STATE to PRD, and AGENT to PAG. The mappings for THEME, LOCATION, PURPOSE, and DIRECTION are extremely inconsistent. In part this is because PropBank captures predicate-centric, sometimes orthogonal distinctions: e.g., the copula is tagged as be.01, and its complement is always PRD—whether the PP describes a location (It is in the box), state (We are in danger), time (That was 4 years ago), etc. Other verbs, like stay and find, similarly have an argument tagged

(8) I$_{Arg1-PPT}$ have been going$_{rel}$ [to the Wildwood, NJ]$_{Arg4-GOL}$ [for over 30 years]$_{ArgM-TMP}$ [for summer vacations]$_{ArgM-PRP}$.

Of interest to this study are the three labels assigned to the prepositional phrases—Arg4-GOL, ArgM-TMP, and ArgM-PRP—and their corresponding supersense labels in (1). If the supersense annotation is valid, we should see a consistent correspondence between these PropBank function tags and semantically equivalent supersenses DESTINATION, DURATION, and PURPOSE, respectively, or their semantic relatives in the hierarchy.

Of the 4,250 supersense-annotated preposition tokens in the REVIEWS corpus (see §3.1), we were able to map 2,973 to arguments in the PropBank annotation—1,435 numbered arguments and 1,538 ArgM arguments. Most of the remaining prepositions belong to non-predicative NPs and multiword expressions, which PropBank does not annotate.

18To perform the mapping, we first converted the gold PropBank annotations into a dependency representation using ClearNLP (https://github.com/clir/clearnlp; Choi and Palmer, 2012) and then heuristically postprocessed the output for special cases such as infinitival to marked as PURPOSE.
we allotted 4 samples each, and for each super-
were undergoers—
which are undergoers—
for each super-

Because Arg0 and Arg1 had been consistently

According to the Preposition

We expect that comprehensively annotated preposi-

We have introduced a new lexical semantics cor-

5 Conclusion

Post hoc analysis. Well after the original annota-

The preposition by for verbs amuse and see would
carry the supersense labels of Stimulus (entity
triggering amusement) and Experiencer (entity
experiencing the sight), respectively. But Prop-
Bank’s choice is verb-specific, assigning PAG based
on which argument displays volitional involvement
in the event or is causing an event or a state change
in another participant (Bonial et al., 2012). Experi-
encer and Stimulus are known to compete over
Dowty’s Proto-Agent status, so this type of mis-
mismatch is not surprising (Dowty, 1991).

Arg1 is similarly muddled. Setting aside the ex-
pected mappings to Theme and Topic—both of
which are undergoers—Arg1 overlaps with Stimu-
lus (for the same reasons as cited above) and, also,
to a wide range of semantics including Purpose,
Attribute, and Comparison/Contrast.

Summary. The (mostly) clean correspondences of
the supersenses to the independently annotated
PropBank modifier labels speak to the linguistic
validity of our supersense hierarchy. On the other
hand, the confusion evident for the supersense la-
bel corresponding to PropBank’s numbered argu-
ments suggests further analysis and refinement
is necessary for both annotation schemes. Some
of these issues—especially correspondences be-
tween labels with unrelated semantics that occur in
no more than a few tokens—are due to erroneous
supersense or PropBank annotations. However,
other categorizations are pervasively inconsistent
between the two schemes, warranting a closer ex-
amination.
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References


