Introducing a Lexicon of **Verbal Polarity Shifters** for English

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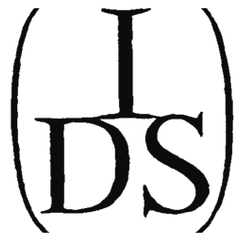
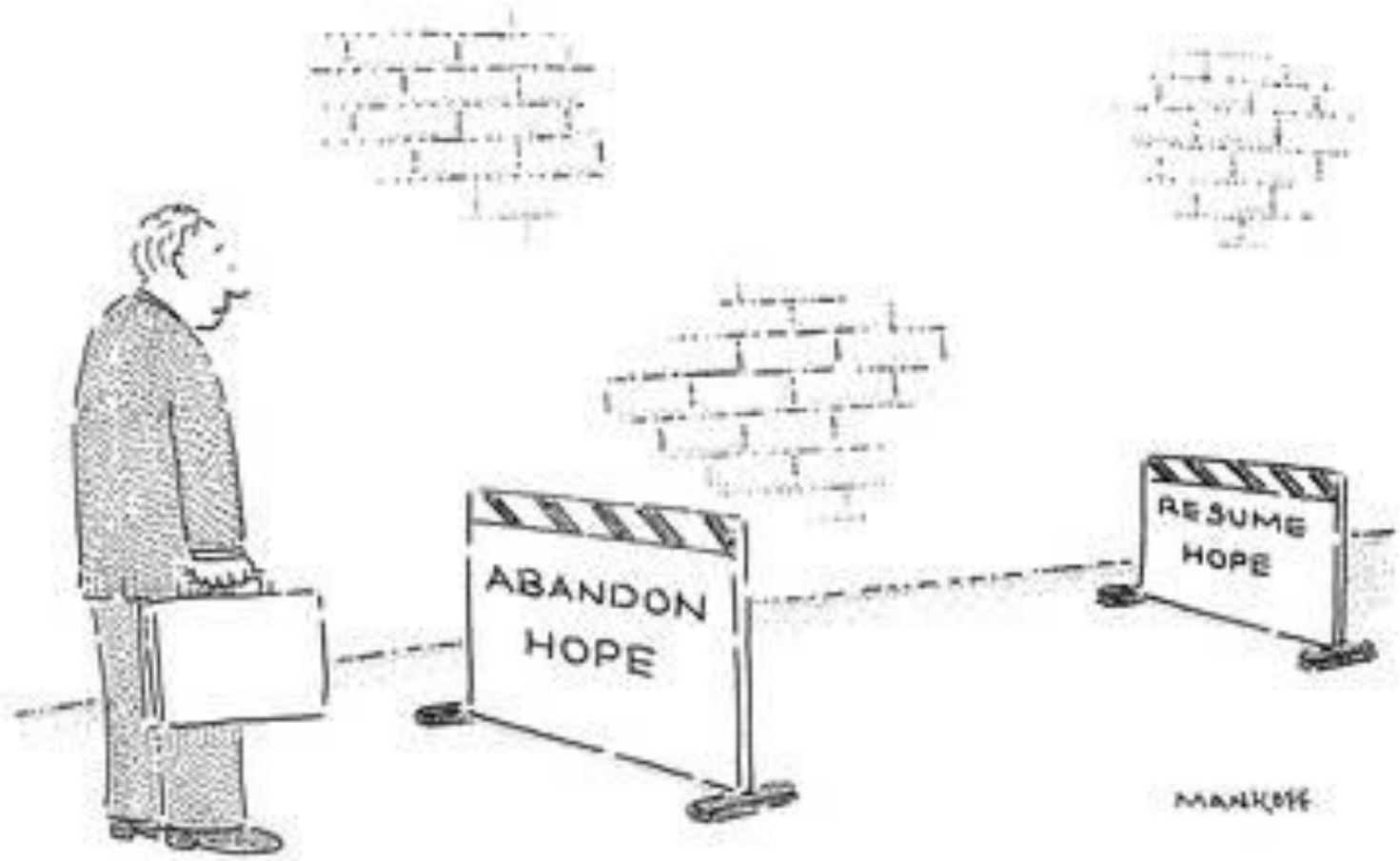


What are Polarity Shifters?



Shifters vs Negation

	Negation	Polarity Shifters
Example	*He did [**not** have [hope]$^{+}$]$^{-}$.*	*He [**abandoned** [hope]$^{+}$]$^{-}$.*

Shifters vs Negation

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Word Type	Closed Class	Open Class

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Resource Creation	Cheap	Expensive

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Existing polarity classifiers
can process negation,
but fail to detect polarity shifters
due to a **lack of resources**.

Goal

Create a Lexicon

of

Verbal Polarity Shifters

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Create a Lexicon

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Verbal Polarity Shifters

Main sentence predicate
⇒ far reaching scope

Overview

- **Polarity Shifters**
  - Related Work
  - Word Sense Ambiguity
  - Shifter Scope
- **Lexicon**
  - Annotation Process
  - Lexicon Example
- **Conclusion**

Related Work

	Supervised Bootstrapping (Schulder et al., 2017)	**Complete Annotation** (this work)
Input Resource	WordNet	WordNet
Lexicon Size	3,000 verbs	10,500 verbs
Shifter Labels	Lemma	Word Sense
Additional Information	-	Shifter Scope

Word Sense Ambiguity

- 50% of verbs are polysemous.
- 12% of verbs are shifters in at least one word sense.
- Among polysemous verbal shifters,
  only 23% are shifters in all their word senses.

Mark down: Reduce in price	**Shifter**
The agency ***[marked down*** *[their assets]*$^{+}$***]***$^{-}$.	

Mark down: Write down	**No Shifter**
She ***[marked down*** *[his confession of guilt]*$^{-}$***]***$^{-}$.	

Shifter Scope

When a phrase contains a polarity shifter, you need to know what part of the phrase it can affect.(Wiegand et al., 2017, GSCL)

[The villain]$^{-}$ ***defeated*** *[the hero]*$^{+}$*.*

[The villain]$^{-}$ ***surrendered*** *[to the hero]*$^{+}$*.*

Shifter Scope

When a phrase contains a polarity shifter, you need to know what part of the phrase it can affect.(Wiegand et al., 2017, GSCL)

dobj

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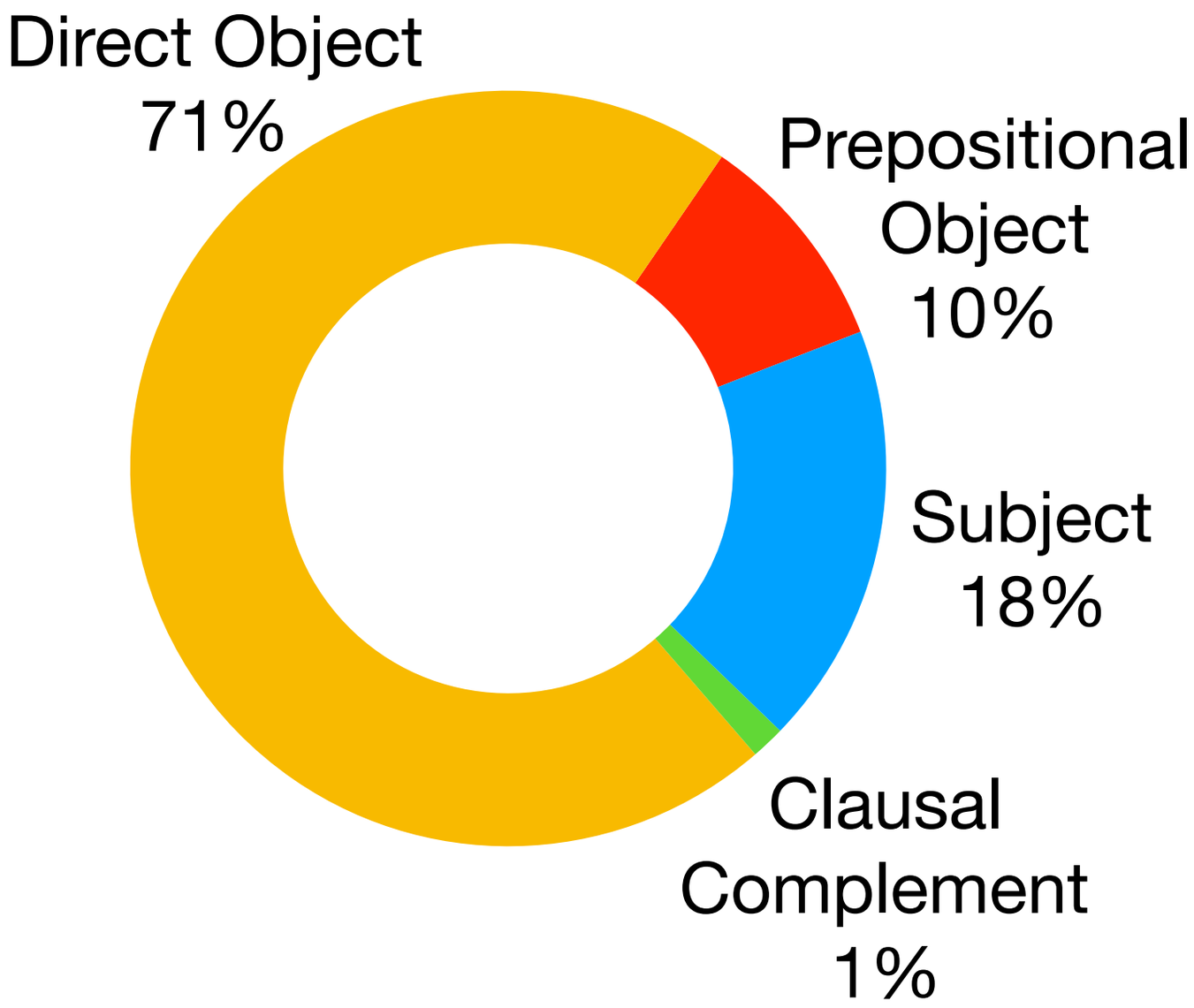
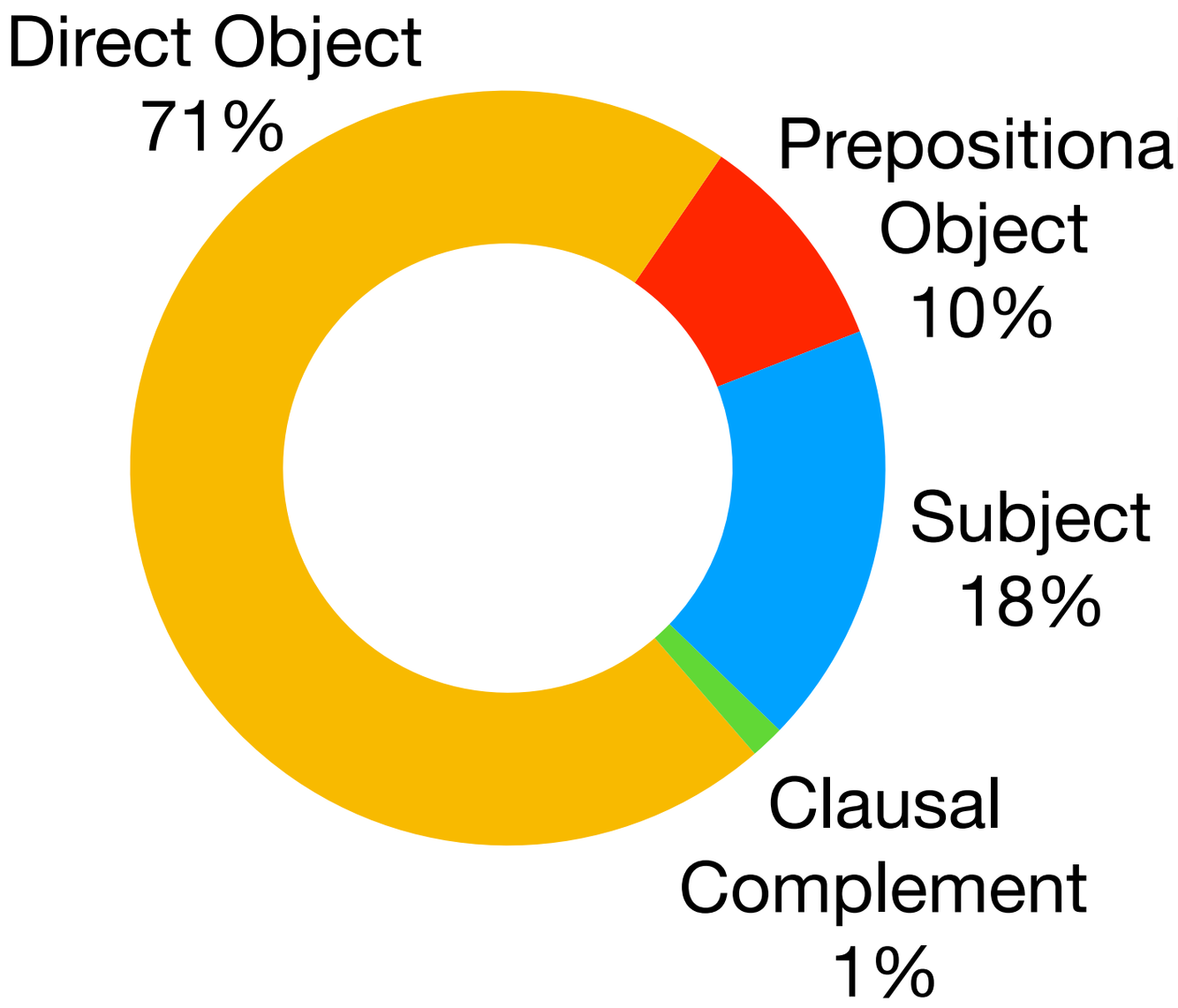
subj

Scope annotated for dependency relations.
Assumes active sentence.

Shifter Scope



Shifter Scope



Verbal shifters affect not only direct objects

Overview

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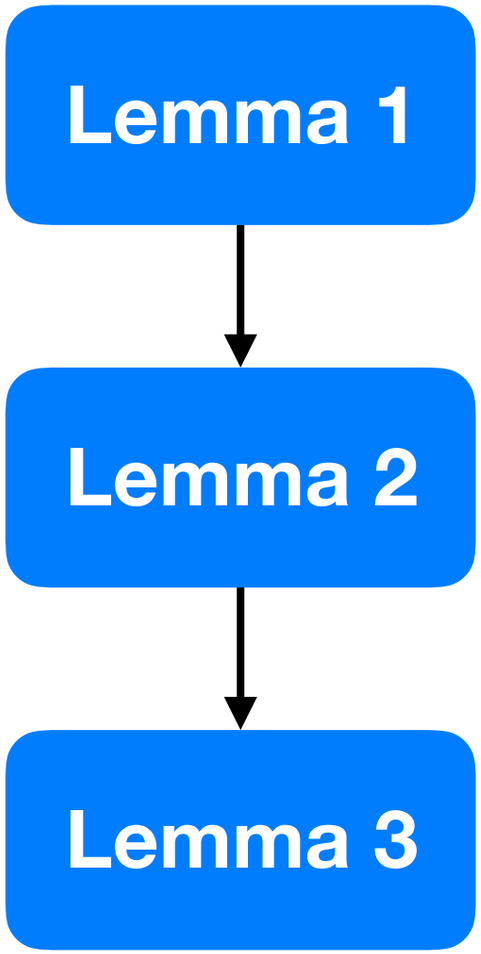
- **Conclusion**

Annotation Workflow



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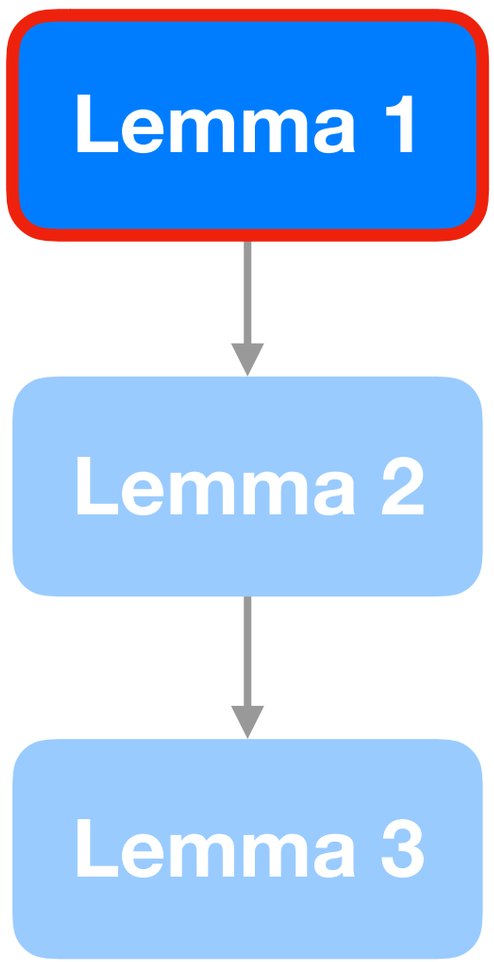

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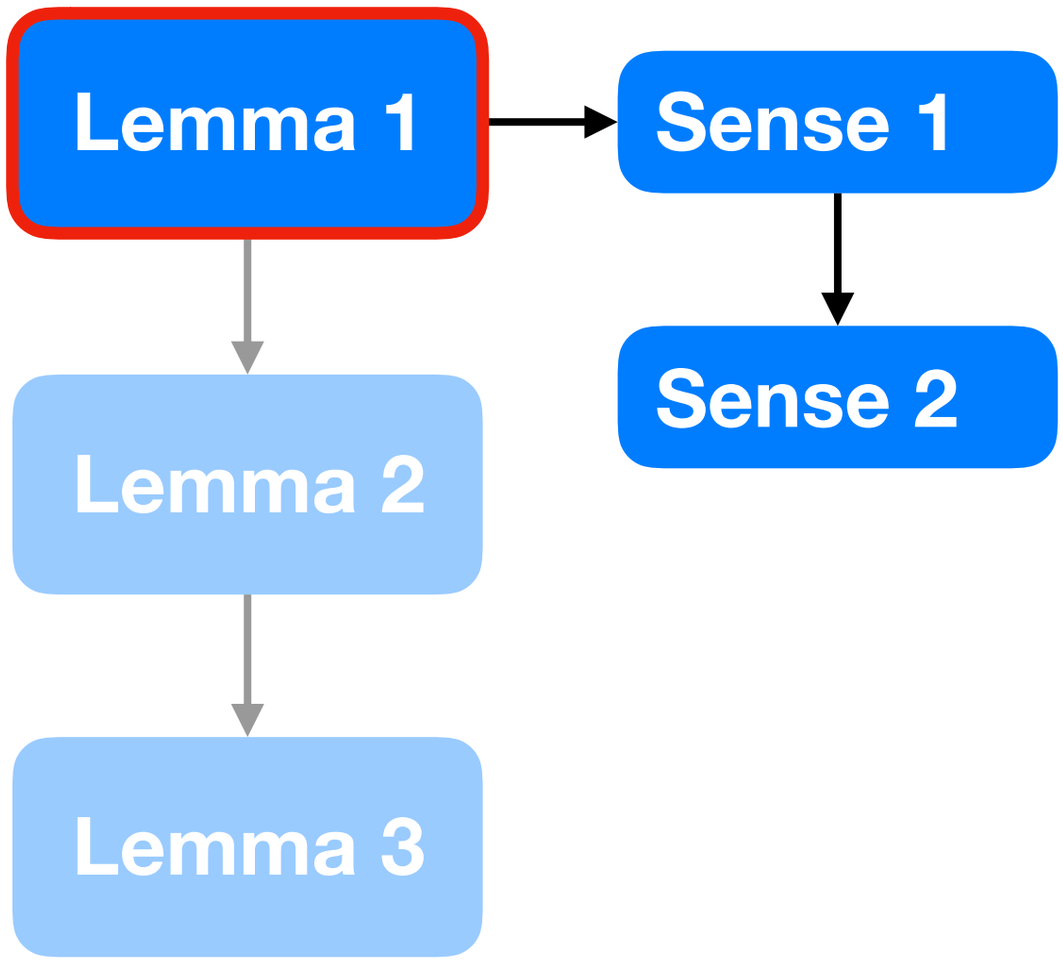

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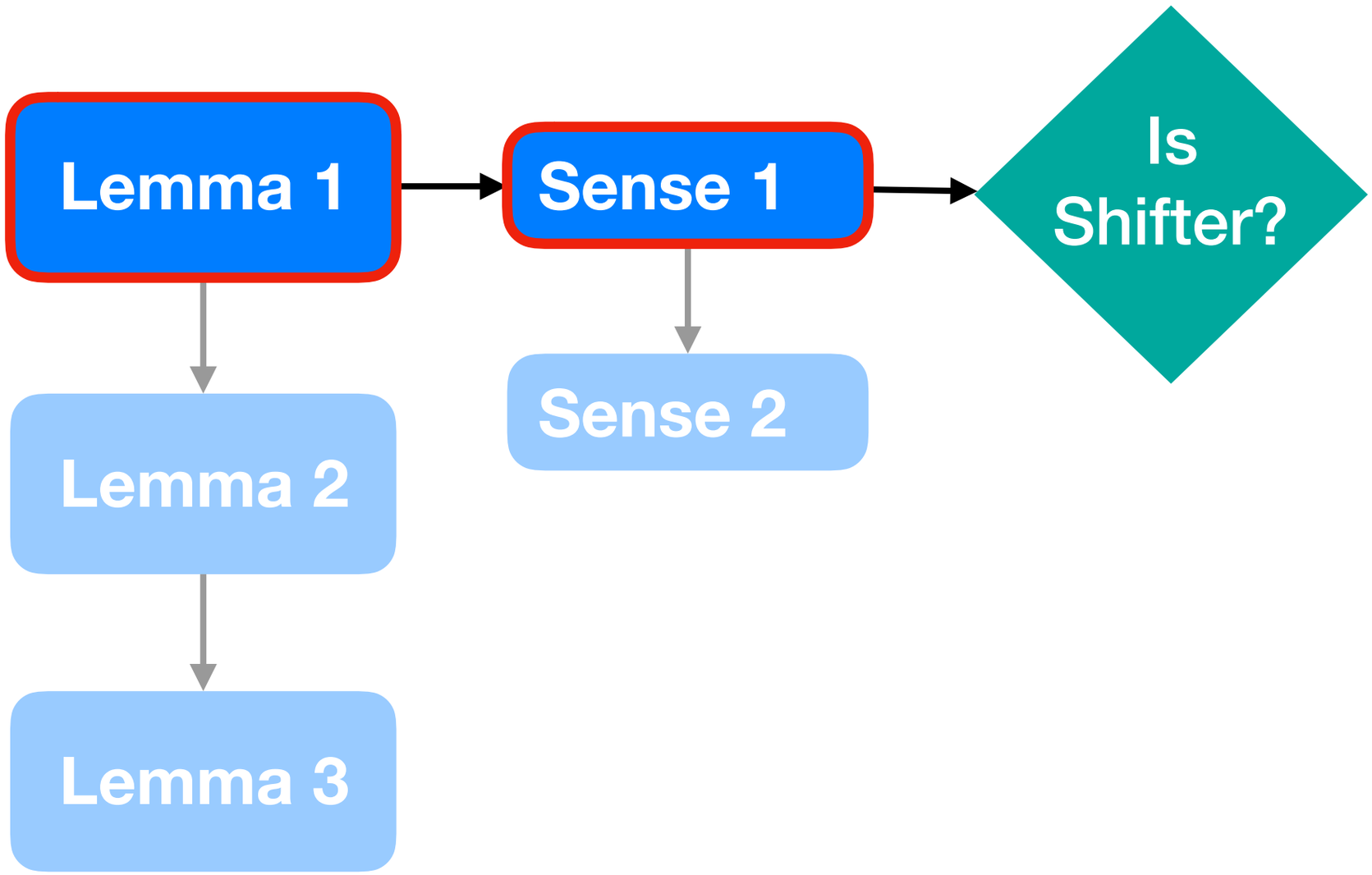

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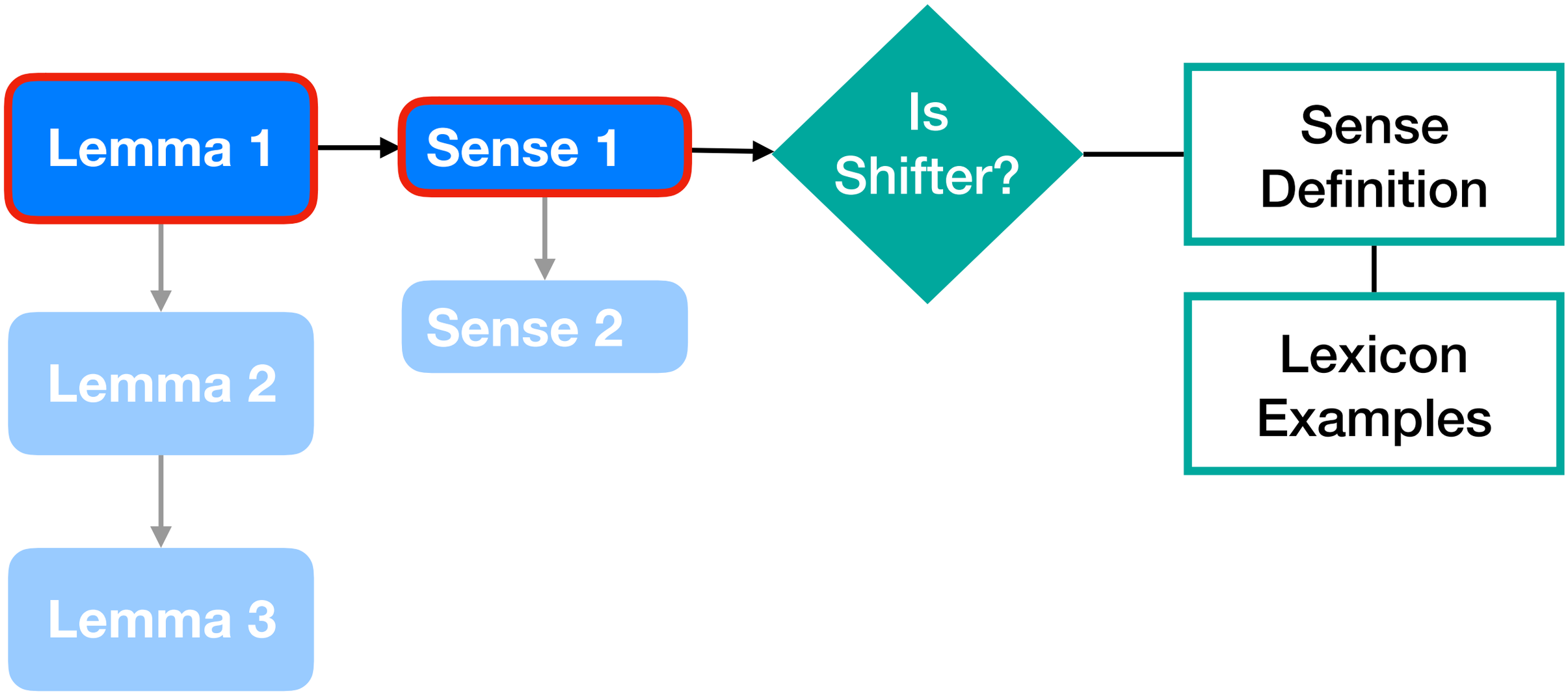

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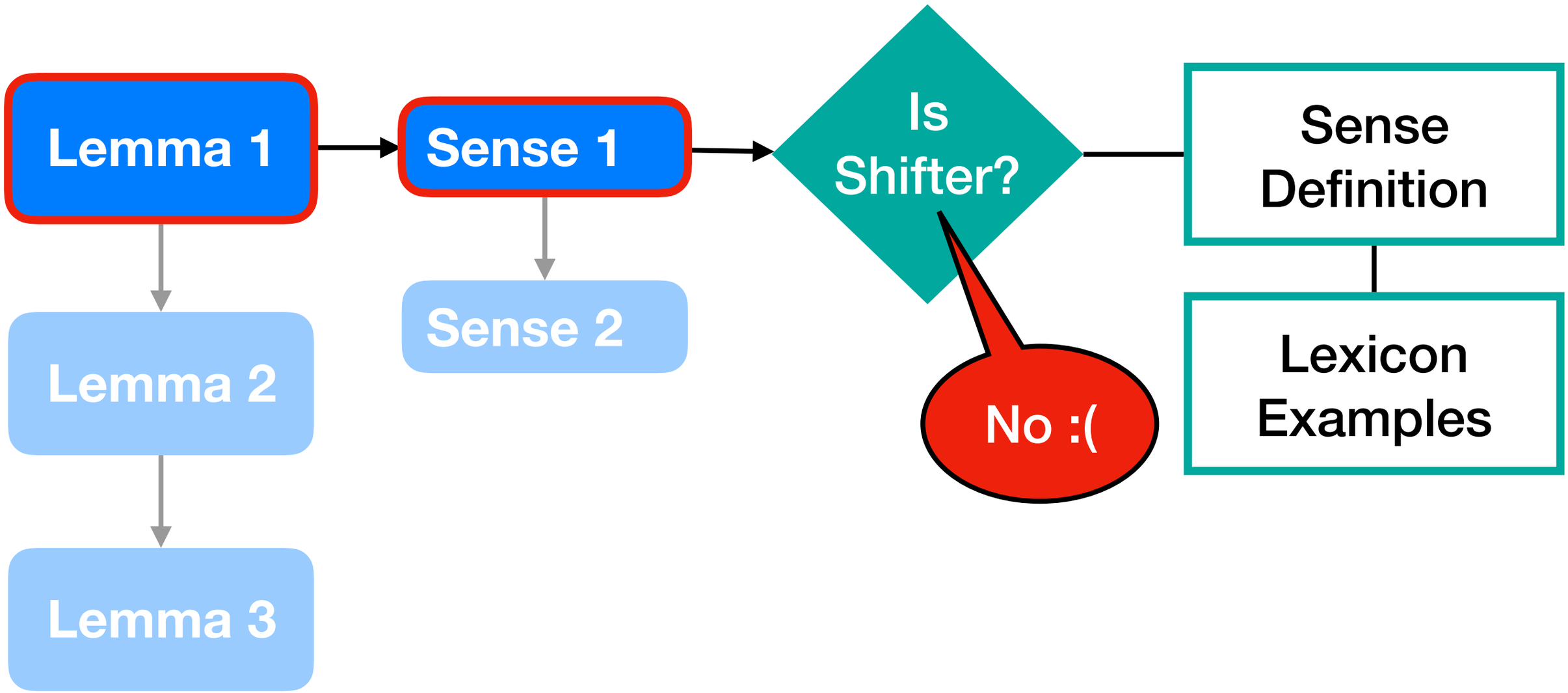

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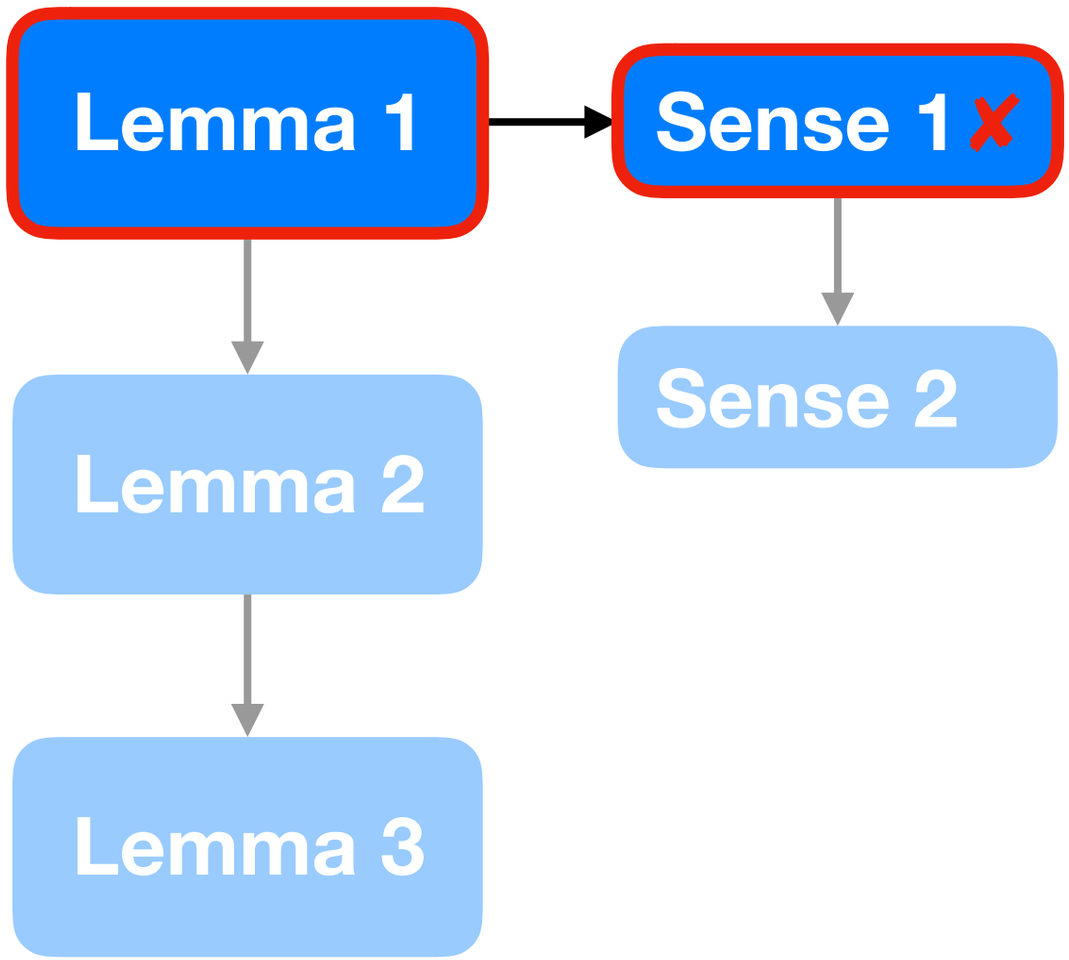

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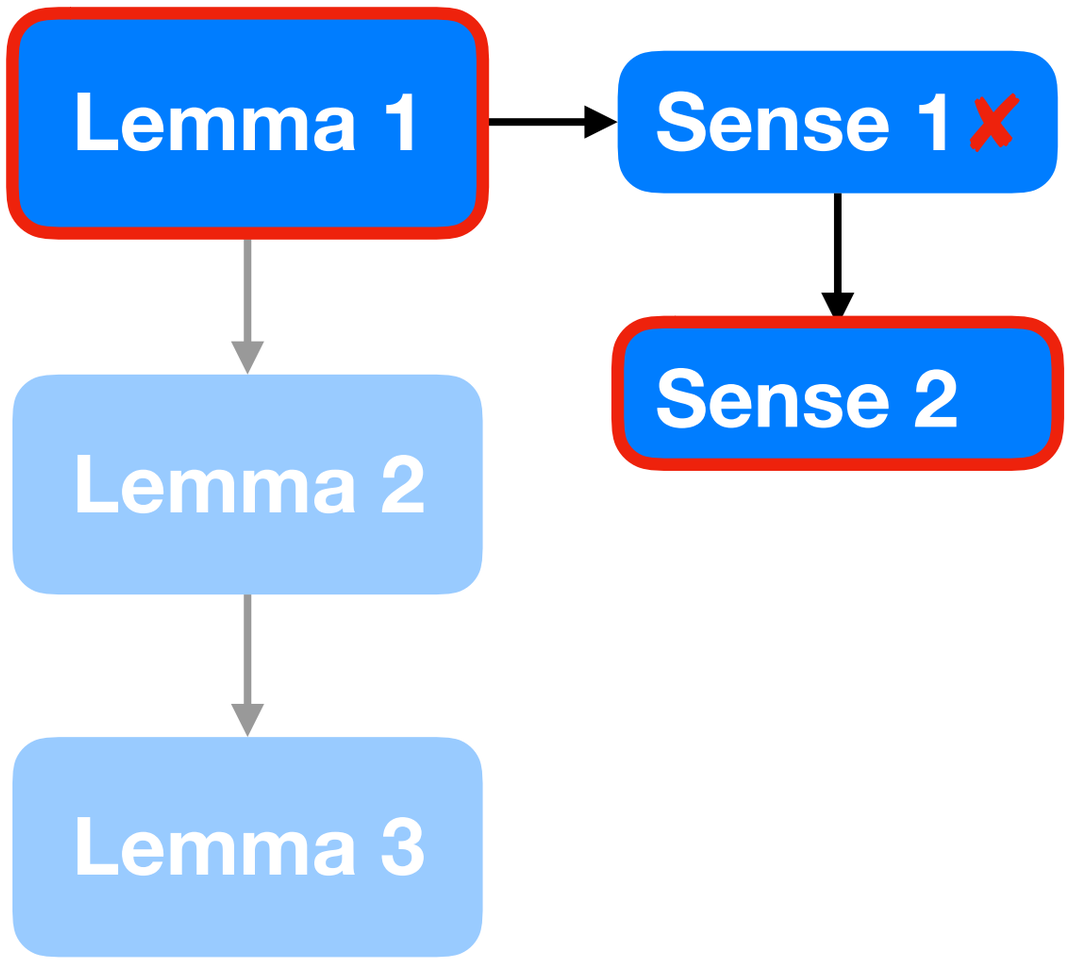

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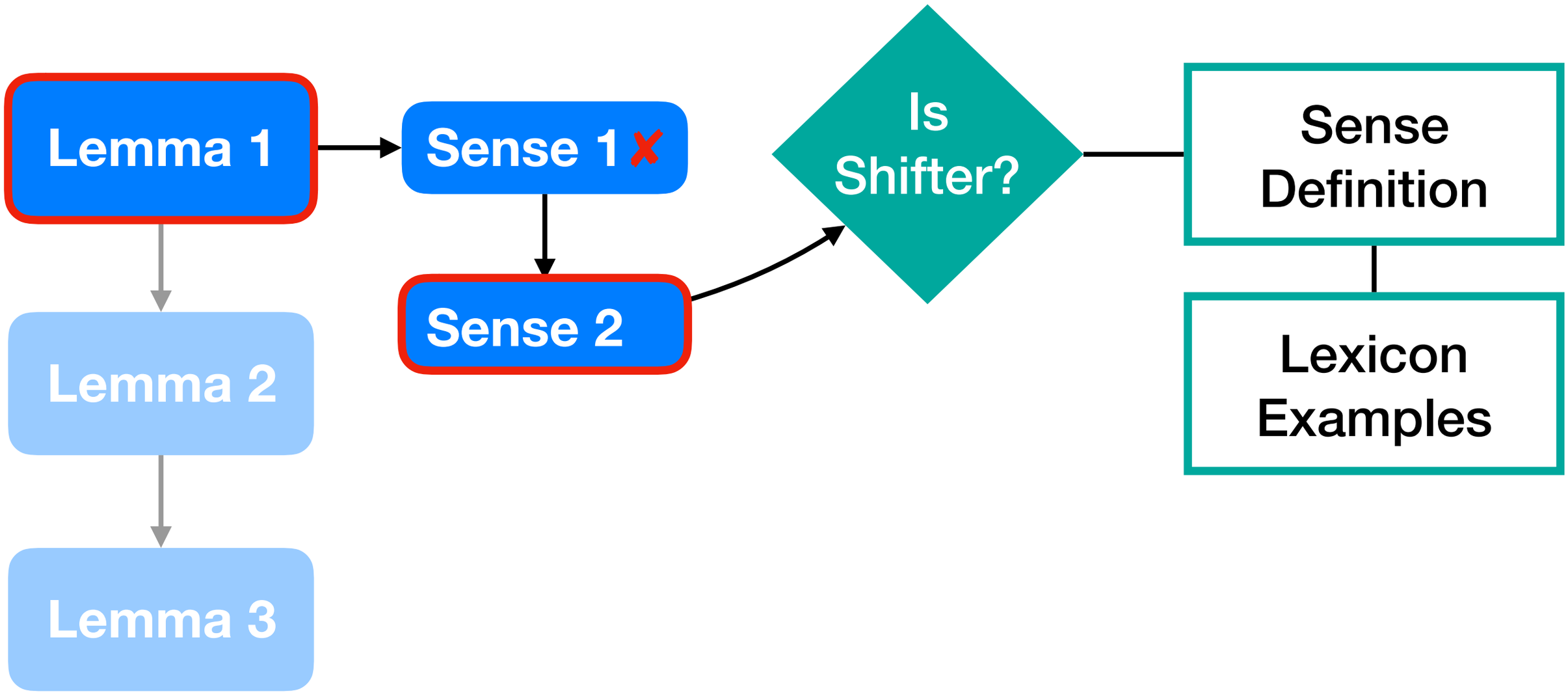

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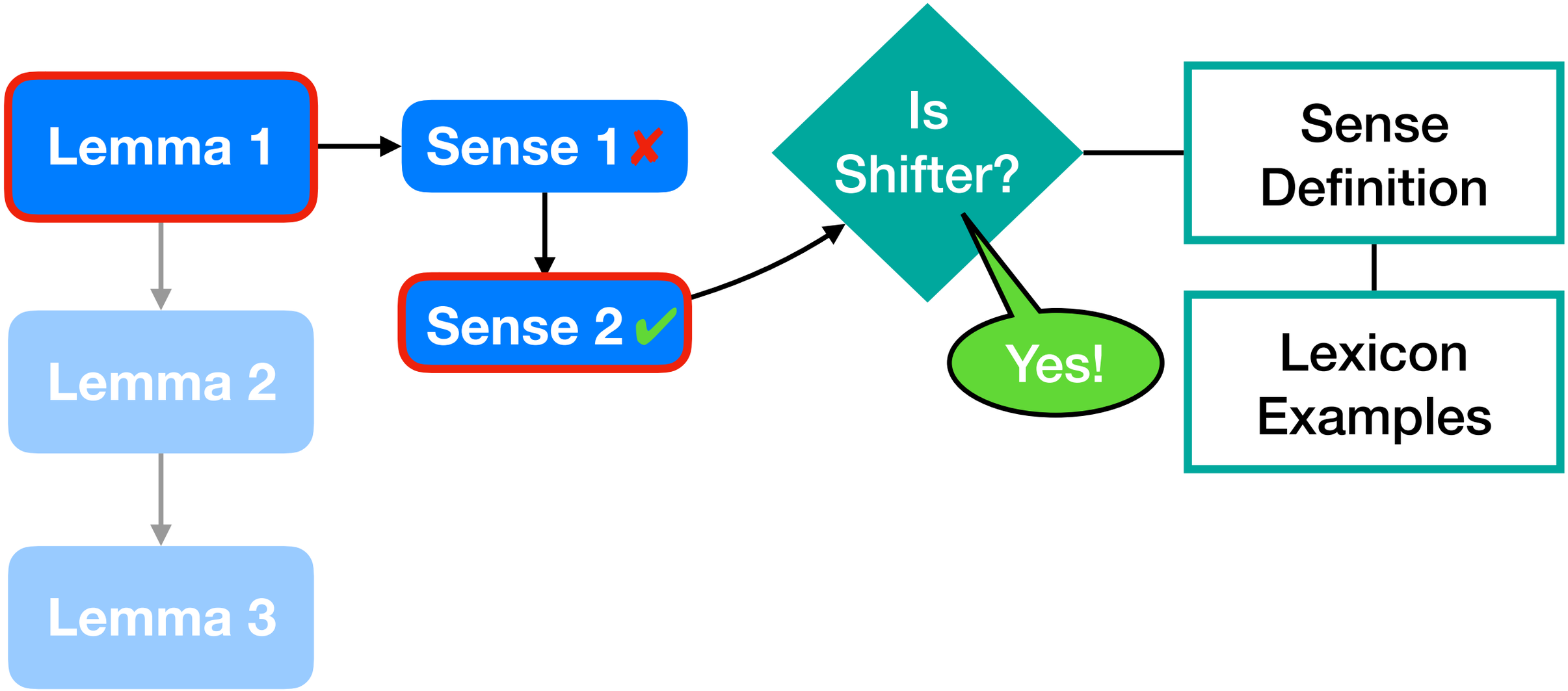

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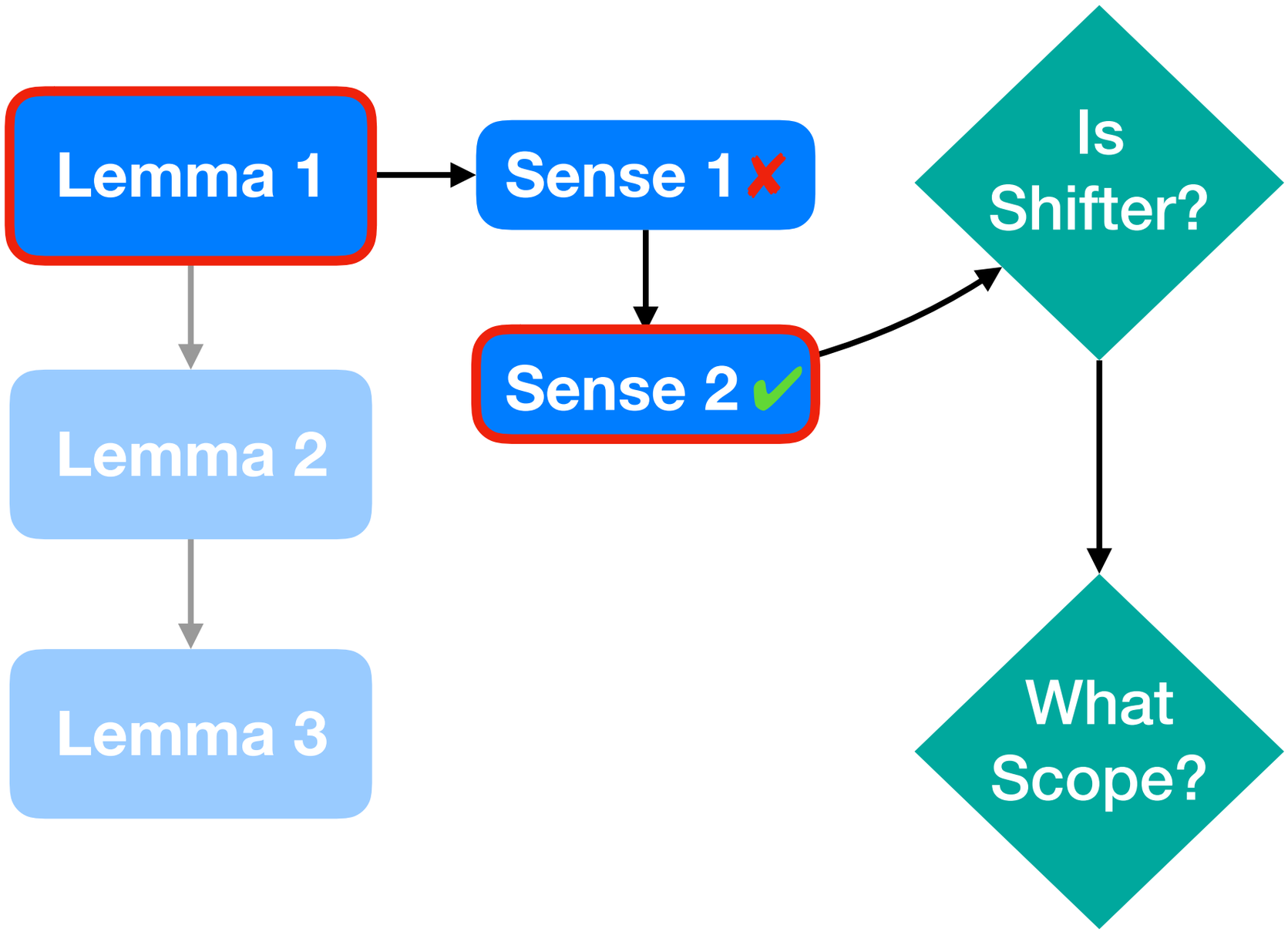

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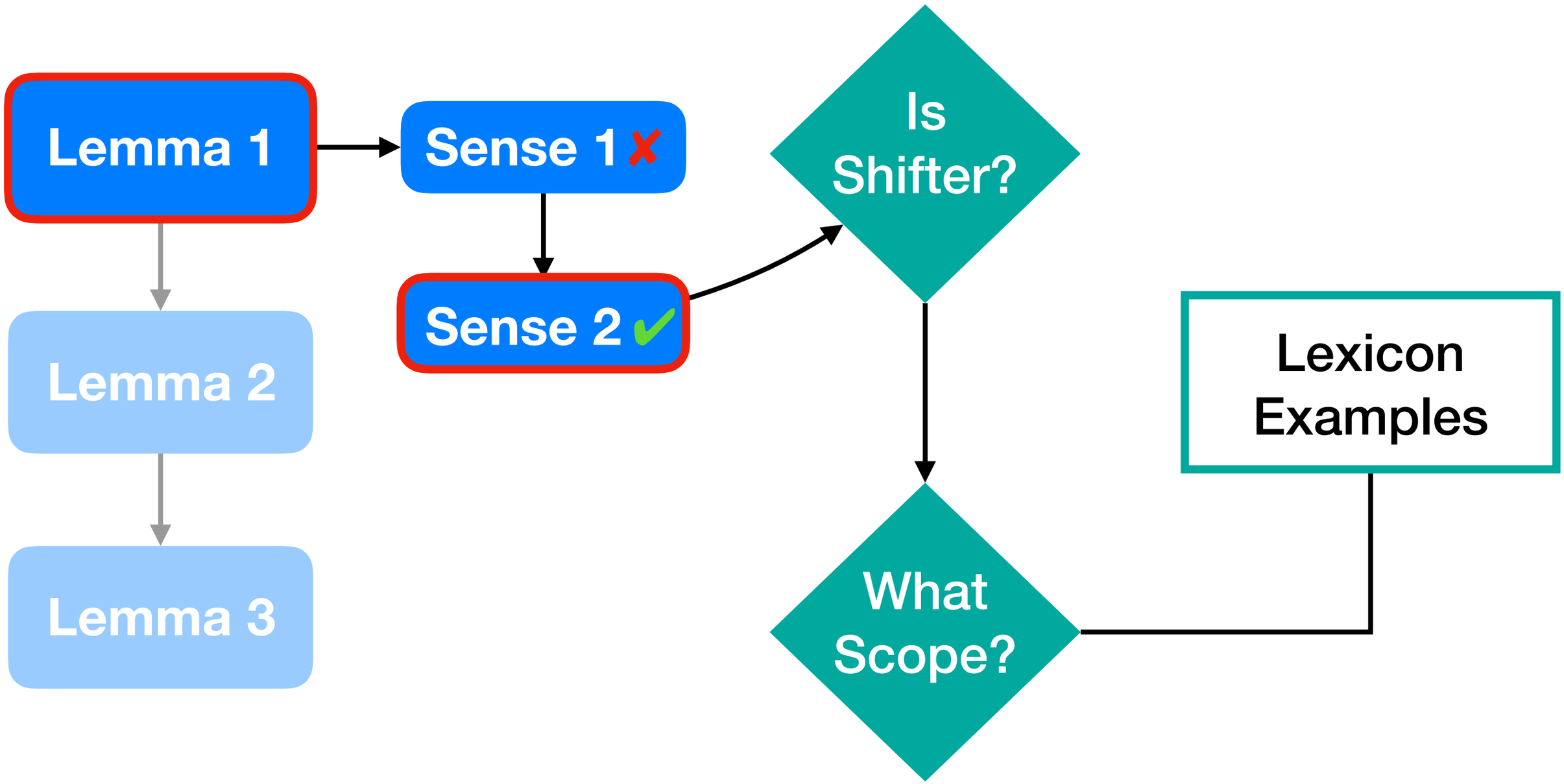

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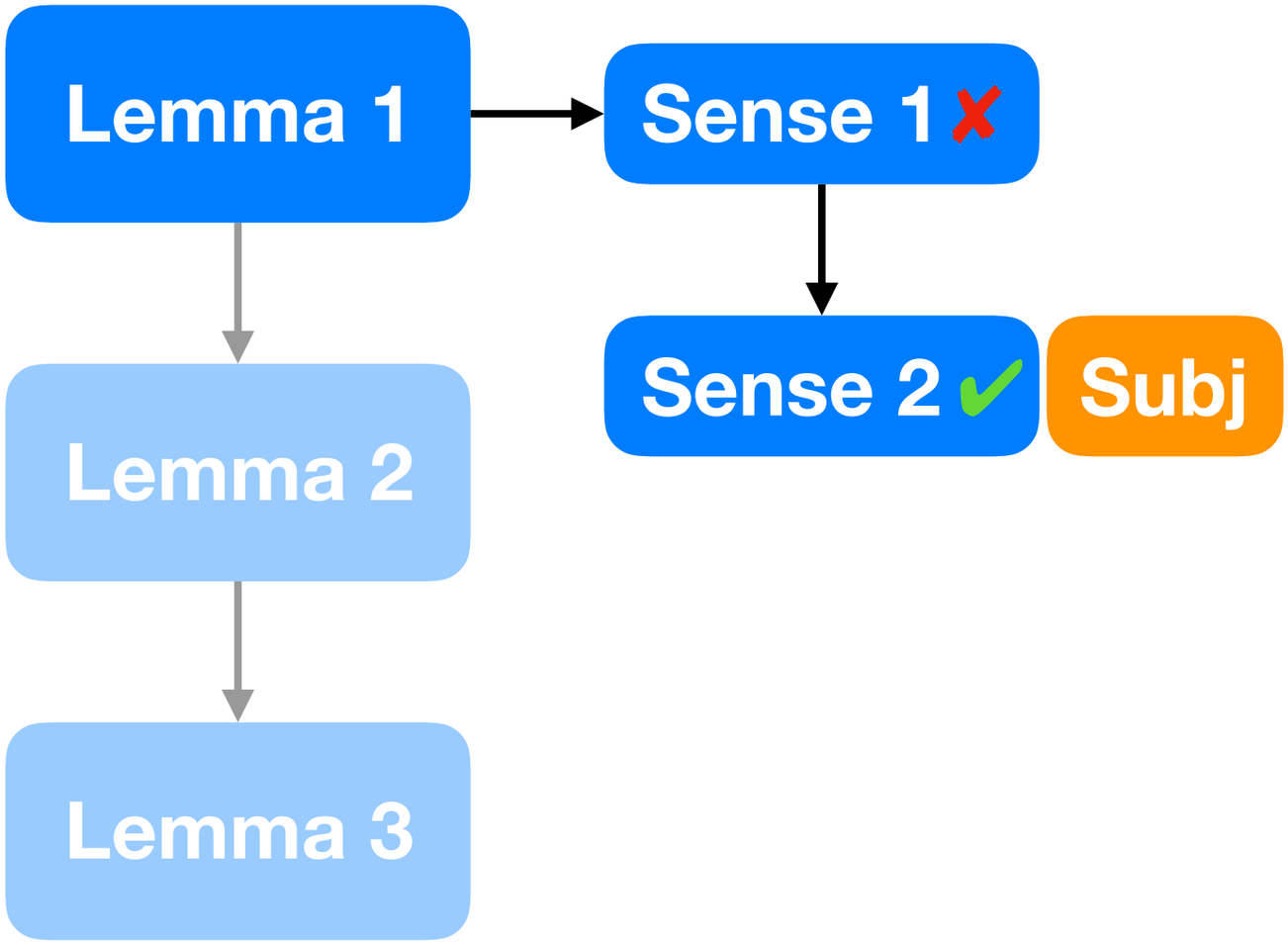

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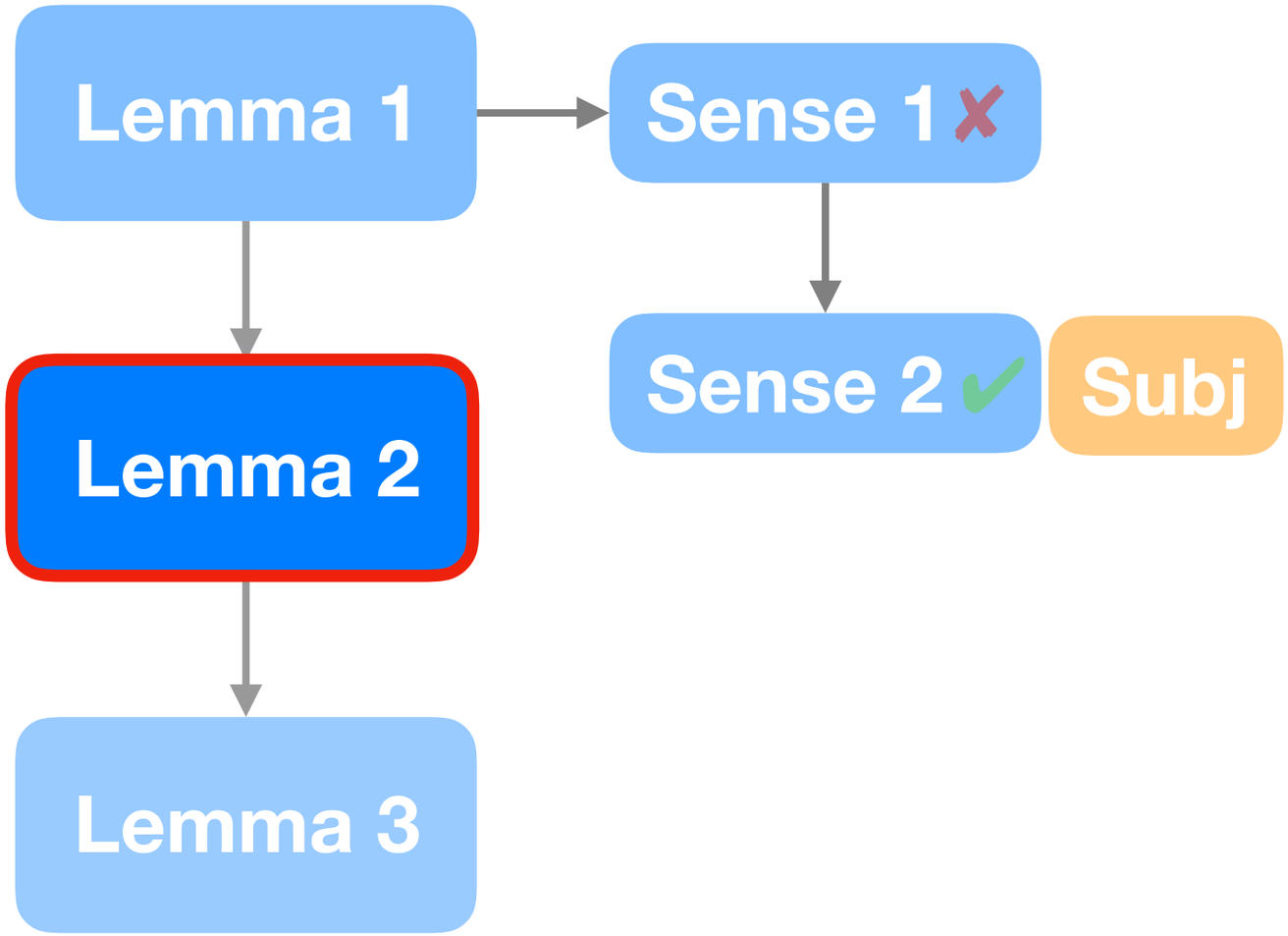

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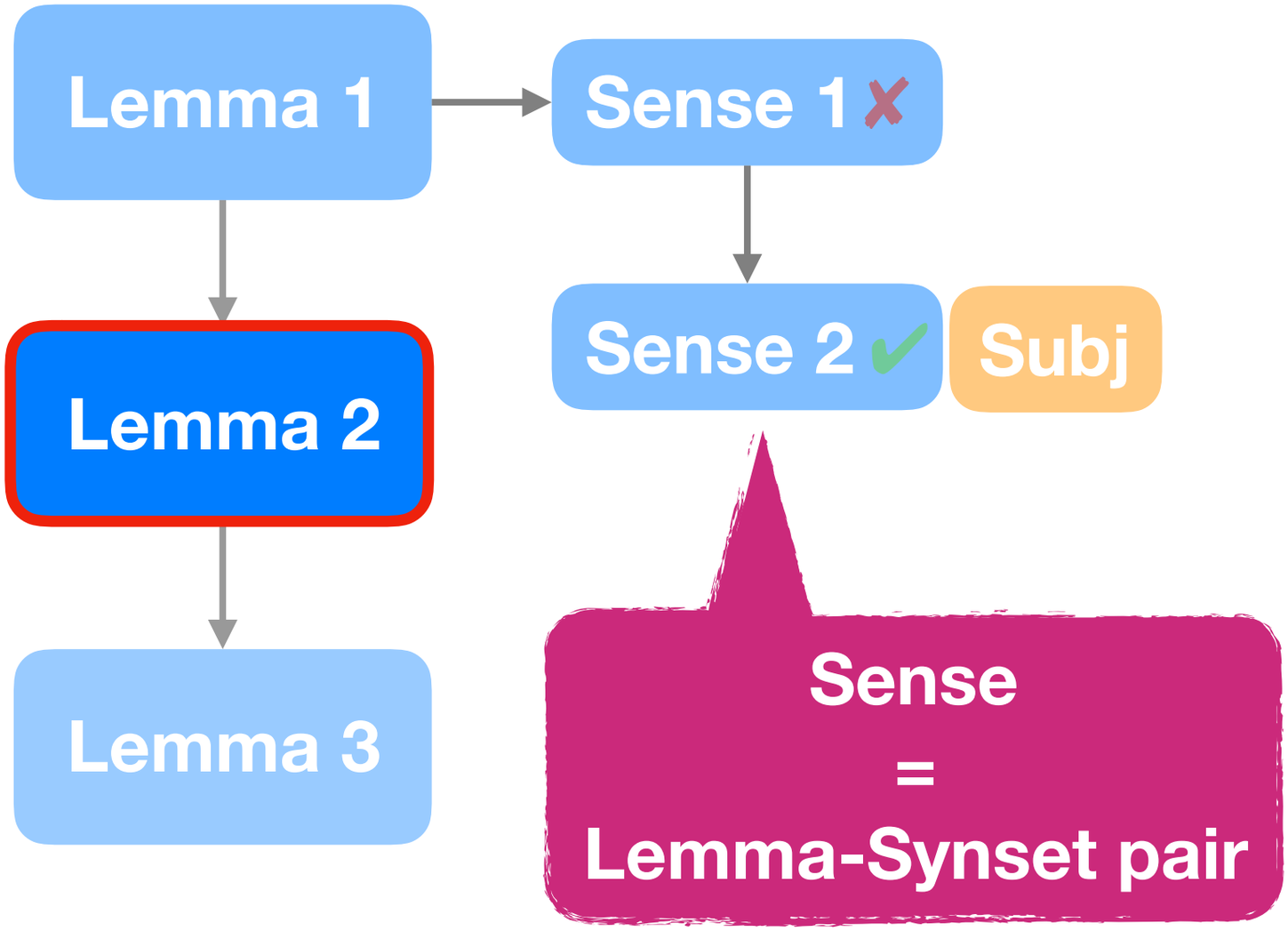

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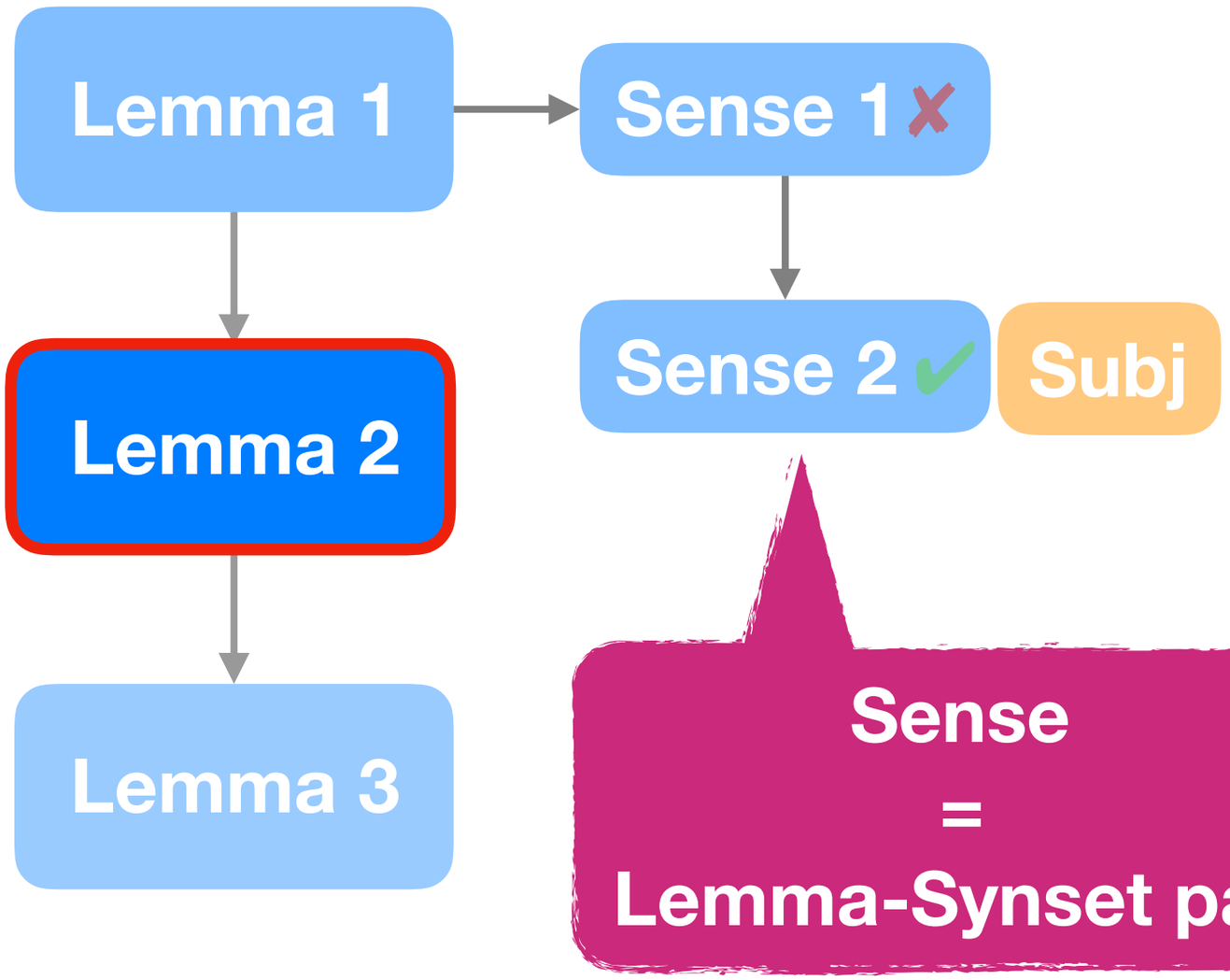

Observation:
Sense annotation considerably faster than lemma annotation

Annotators

Expert Annotator:
Experience in linguistics and annotation work

Inter-annotator Agreement:
2nd annotator labelled 400 word senses
Cohen's κ = 0.73
⇒ Substantial agreement

Both annotators are authors of this paper.

Lexicon Example

Blow out	Synset 00436247	SUBJ	Shifter
melt, break, or become otherwise unusable			

Blow out	Synset 02767855	DOBJ	Shifter
put out, as of fires, flames, or lights			

Blow out	Synset 02766970	-	No Shifter
erupt in an uncontrolled manner			

Conclusion

Summary

We introduced a **lexicon** of English **verbal shifters:**

- Covers all verbs in WordNet
- Annotations for each **word sense**
- **Shifter** labels
- **Shifter scope** labels

Data

- https://github.com/uds-lsv/lrec2018

Future Work

- Nouns, adjectives
- Other languages

Thank You

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- Nouns, adjectives
- Other languages

Real World Distribution

How frequent are shifters in actual corpora?

Corpus: Amazon Product Reviews(Jindal and Liu, 2008)
5.8 million reviews
Popular sentiment analysis domain

Heuristic:

1. List all lemmas that have at least one shifter sense
2. Count occurrences of shifter lemmas
3. Normalize over shifter sense ratio of lemma

Example:

blow out: 2290 occur. * ⅔ shifter senses = 1527 shifter occur.

Real World Distribution

Verbal Shifters

Vocabulary: 1163 words
(95% of shifters in lexicon)

Raw count: 34 million

Corrected count: 13 million
(5% of verbs in corpus)

Negation

Vocabulary: 15 words (Wilson et al., 2005)

Count: 13 million

Fun Facts

1. Annotating per word sense is faster than per lemma.
2. Corpus frequency tests show that verbal shifters are as frequent as negations

Shifter Scope

Subject *(subj)*:

[[The villain]$^{-}_{subj}$ ***surrendered***]$^{+}$ *[to the hero]*$^{+}$.

Direct Object *(dobj)*:

The storm ***[ruined*** *[their party]*$^{+}_{dobj}$ ***]***$^{-}$.

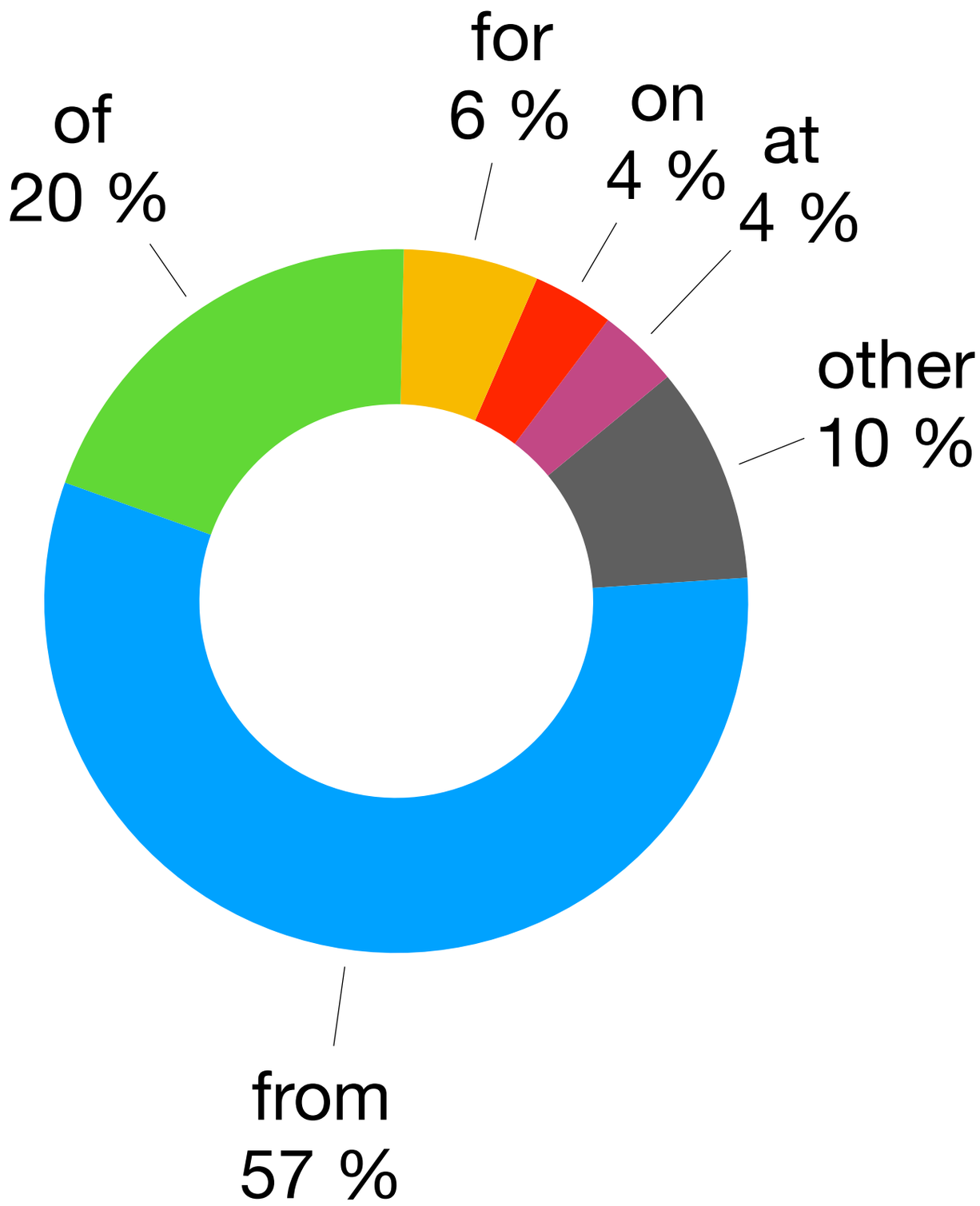
Prepositional Object *(pobj)*:

The wall ***[shielded*** *them [from the explosion]*$^{-}_{pobj}$ ***]***$^{+}$.

Clausal Complement *(comp)*:

He ***[failed*** *[to pass the exam]*$^{+}_{comp}$ ***]***$^{-}$.

Shifter Scope: Prepositions



The Trouble with Synsets

Synsets do not model syntactic information

He ***[discarded*** *[the evidence]*$^{+}$*]*$^{-}$*.*
⇒ direct object

He ***[disposed*** *[<u>of</u> the evidence]*$^{+}$*]*$^{-}$*.*
⇒ prepositional object

The Trouble with Synsets

Synsets do not model syntactic information

WordNet	
S: (v)	discard, dispose, [...] (throw or cast away) "***Put away your worries***"

*He **[discarded** [the evidence]+]-.*
⇒ direct object

*He **[disposed** [<u>of</u> the evidence]+]-.*
⇒ prepositional object

Annotation Granularity

Lemma

Lemma 1 + Sense 1
Lemma 1 + Sense 2
Lemma 1 + Sense 3

Synset

Lemma 1 + Sense 1
Lemma 2 + Sense 1
Lemma 3 + Sense 1

Lemma-Sense Pair

Lemma 1
Sense 1