

# Semantic Supersenses for English Possessives

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# Introduction

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## Possessor

John's car

John's house

John's computer

## SocialRel

John's mother

John's sister

John's boss

# Introduction

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## Possessor

John's car

John's house

John's computer

## SocialRel

John's mother

John's sister

John's boss

... Polysemy!

# Introduction

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SocialRel

Kate's sister

the sister **of** Kate

# Introduction

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Possessor

Kate's dog

?the dog **of** Kate

# Introduction

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the boy 's murder

the murder **of** the boy

# Introduction

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Agent

the boy 's murder

Theme



the murder **of** the boy

Theme



# Introduction

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Agent

the boy 's murder

Theme

≠

the murder **of** the boy

Theme





# Introduction

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English possessive constructions:

- $[NP_1]$ 's  $[NP_2]$  - **s-genitive**
  - [*my*, *your*, ...]  $[NP_2]$  - possessive pronouns
- $[NP_2]$  of  $[NP_1]$  - **of-genitive**

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English possessive constructions:

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Some relevant features: *animacy, givenness, and syntactic weight*  
Stefanowitsch (2003)

# Research Questions

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- How can we annotate a corpus of English possessives with a common inventory of semantic relations?
- What does this tell us about the distribution of relations with respect to constructions?

# Contributions

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- We adopt a semantic annotation scheme designed for adpositions and apply to English possessives constructions.
- We show the semantic divergence of s-genitive and of-genitive
- Corpus release: <http://tiny.cc/streusle> (55,000 words)
  - **1,104 s-genitive** tokens annotated NEW
  - **509 of-genitive** tokens annotated
- Comprehensive annotation, no “other” category

The v2 hierarchy is a tree with 50 labels. They are organized into three major subhierarchies: **CIRCUMSTANCE** (18 labels), **PARTICIPANT** (14 labels), and **CON-FIGURATION** (18 labels).

### Circumstance



### Participant



### Configuration



# Adposition Supersenses

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- Adposition supersense inventory designed with adpositions (including **of**) and grammatical case in mind.
- 50 general categories - thematic role labels ([Agent](#), [Theme](#), [Recipient](#), etc.) and relations that hold between entities ([Possessor](#), [Whole](#), [SocialRel](#), etc.)
- Applied to English, German, Korean, Hebrew, and Hindi thus far.

# Related Work

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- Previous work labeling semantics of possessives by Tratz and Hovy (2013) and Badulescu and Moldovan (2009).
- Badulescu & Moldovan contrast of-genitive and s-genitive semantics with a schema designed for nominal relations
- Previous semantic categories specific to relations between nominals (Badulescu and Moldovan) or s-genitives (Tratz and Hovy).

# Related Work

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- We start with categories designed for adpositions/case and apply them to possessives
- Schneider et al. schema's advantage: **Comparability!**



# Corpus Annotation

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- Annotation (by 2 Linguists) of all tokens of the genitive 's clitic and possessive pronouns (s-genitives) in a 55,000 word corpus of English web reviews.
- 28 attested supersense labels (out of 50 total).
- 1,104 s-genitives (509 of-genitives already annotated)

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- 28 attested supersense labels (out of 50 total).
- 1,104 s-genitives (509 of-genitives already annotated)
- annotators agree 72% of the time
- Cohen's  $\kappa$  is 0.66

I was able to cancel it but only after paying a \$ 50 fee (

stative

`i

change

RelativeTime

possession

POSSESSION

which the staff person who signed me up stated I would not have to

GROUP

PERSON

communicat

communicat

cognition

pay if I had proof of moving ) and being spoken

possession

stative

COGNITION

ACT

`a

communicat

to in a very belittling

Recipient

Manner

Quantity

Possessor

Whole

Superset

Topic

Theme

Patient

Instance

Agent

Material

Element

Stimulus

I was able to cancel it but only  
who signed\_me\_up stated I would  
being spoken-to in a very belittling

) fee ( which the staff person  
I had proof of moving ) and

« Previous

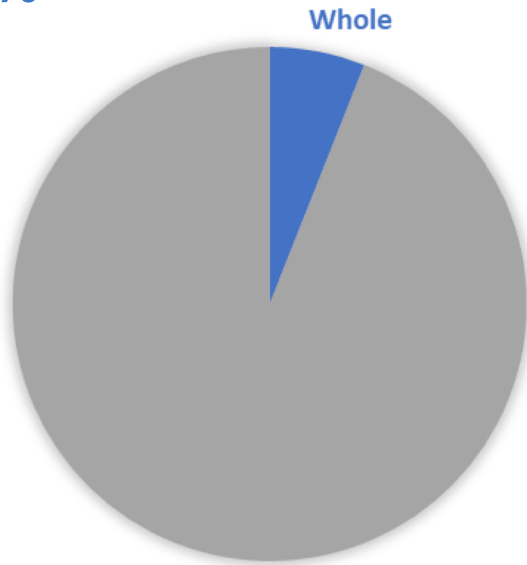
Note for sentence ewtb.r.071650

I am certain OF that. | Let bards sing now OF barbiturates as bright as violets .  
((statement verbs)) | These she would learn OF only through other people .  
((hearing/learning verbs)) | a photograph OF the bride | I don't know OF  
anything that would be suitable. | Hobbes conceived of what he called a state  
OF nature. | All three were convinced OF his innocence.

Information content. {about, around, as regards, as to, concerning, for, in, into,  
of, on, over, re, regarding, round, towards, with}

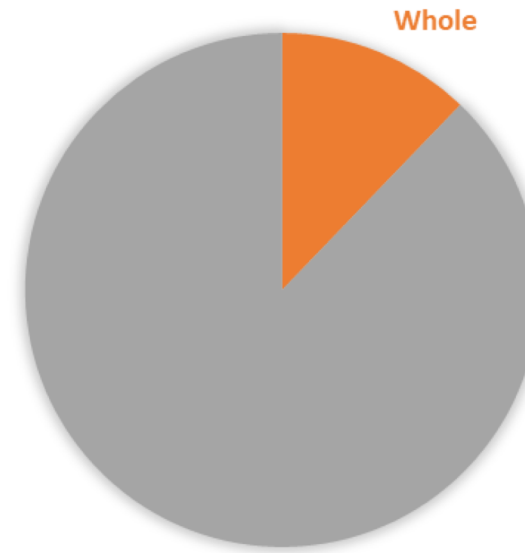
# Whole

S-genitive 6%



*my cars gears and brakes*

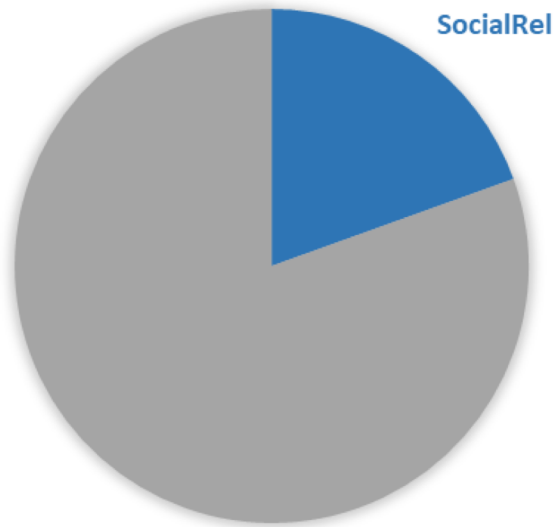
Of-genitive 12.2%



*the southeast side **of** Murfreesboro*

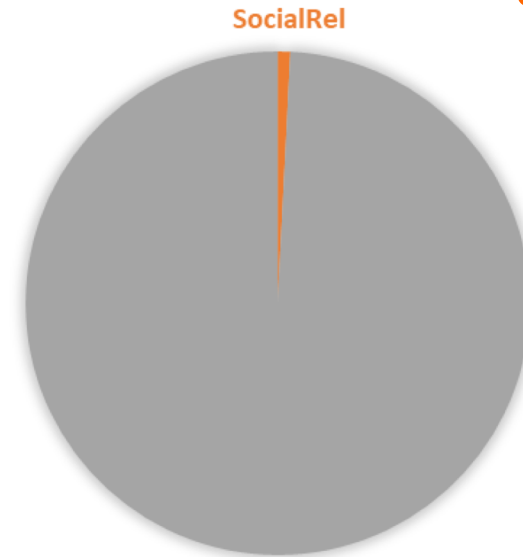
# SocialRel

S-genitive 19.5%



***my** boyfriend's aunt*

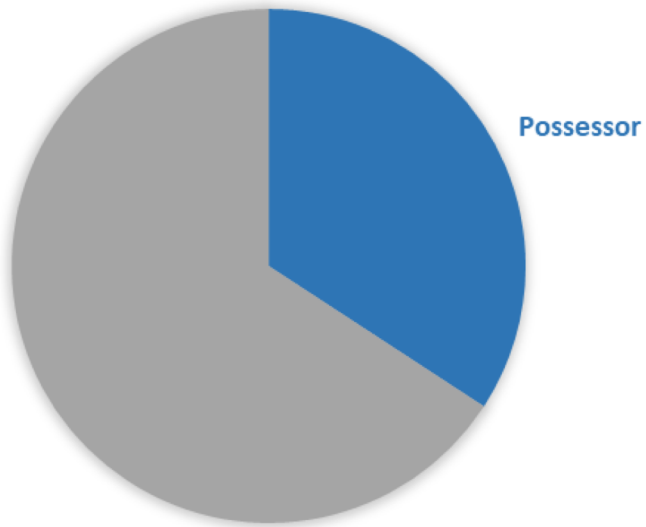
Of-genitive 0.8%



*parents **of** my high school friends*

# Possessor

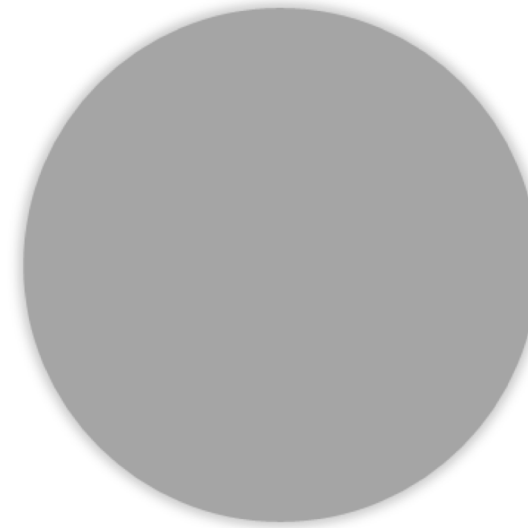
S-genitive 34.2%



*[he] even remembered her dog*

Possessor

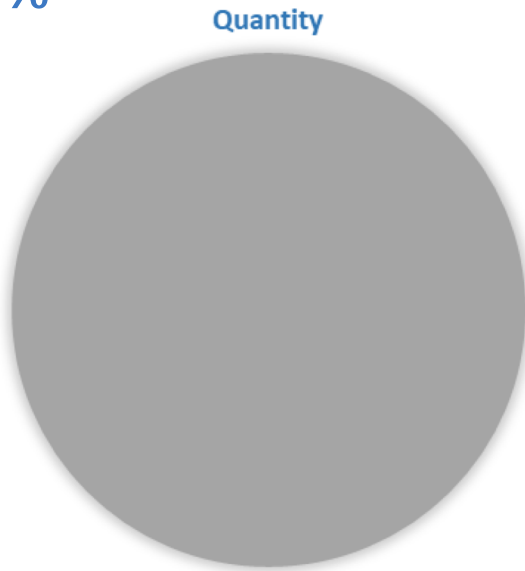
Of-genitive 0%



*(COCA: the office of the Prime Minister)*

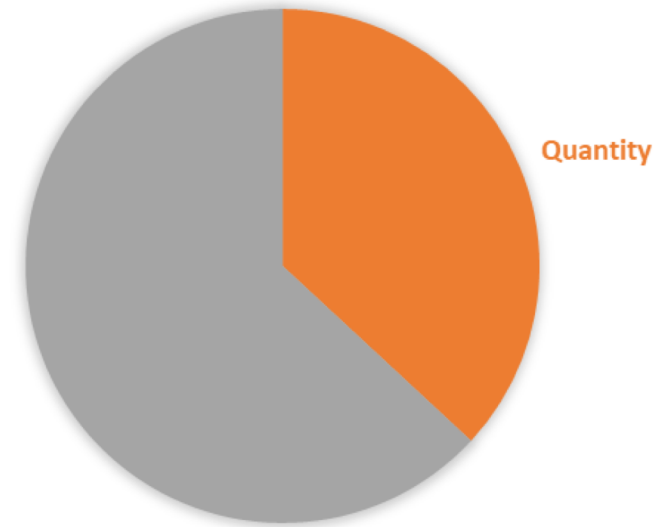
# Quantity

S-genitive 0%



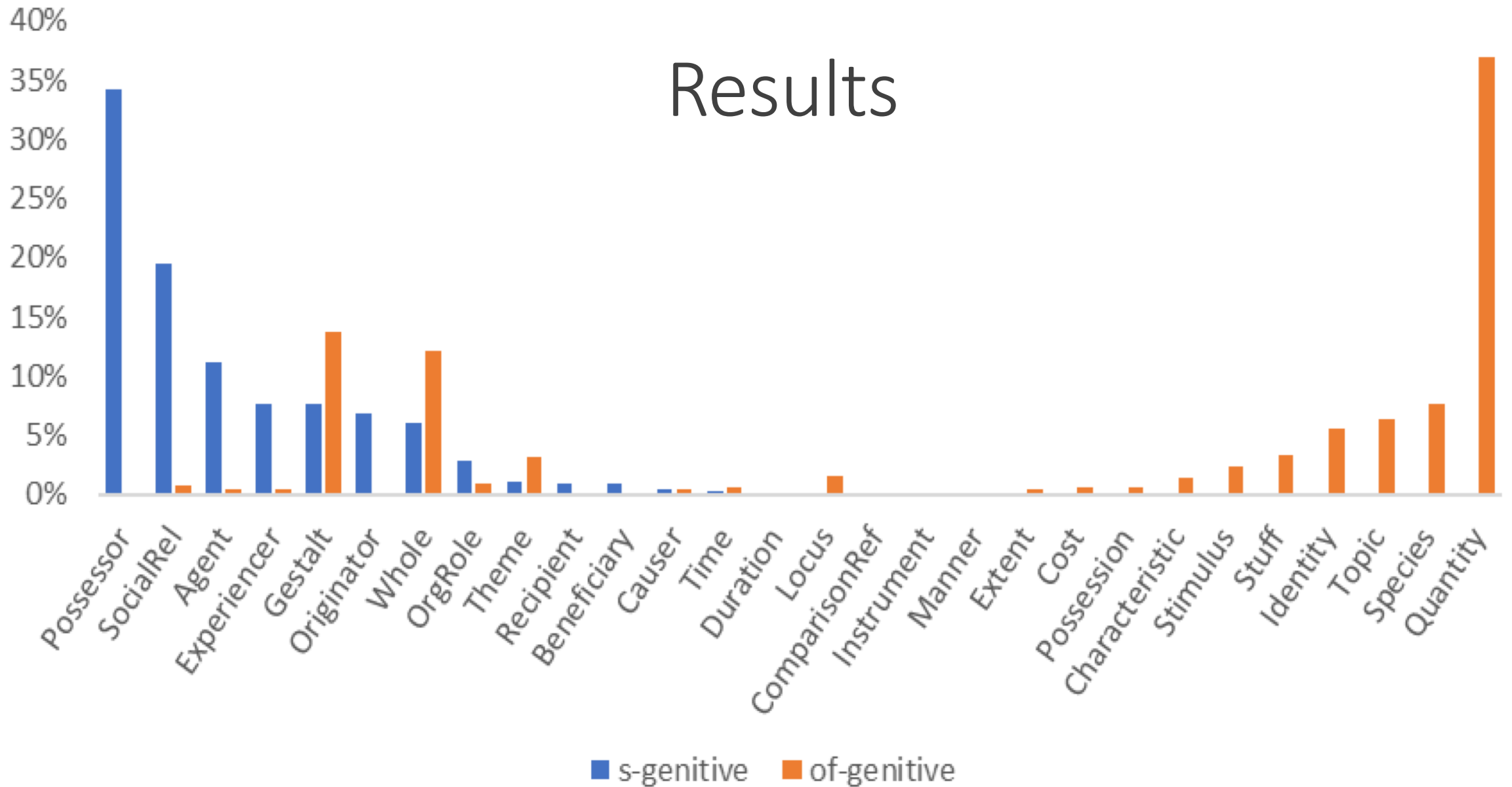
\*\*\*parking's plenty

Of-genitive 36.9%



There's plenty **of** parking

# Results





# Results

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- Supersenses only attested for **of**:

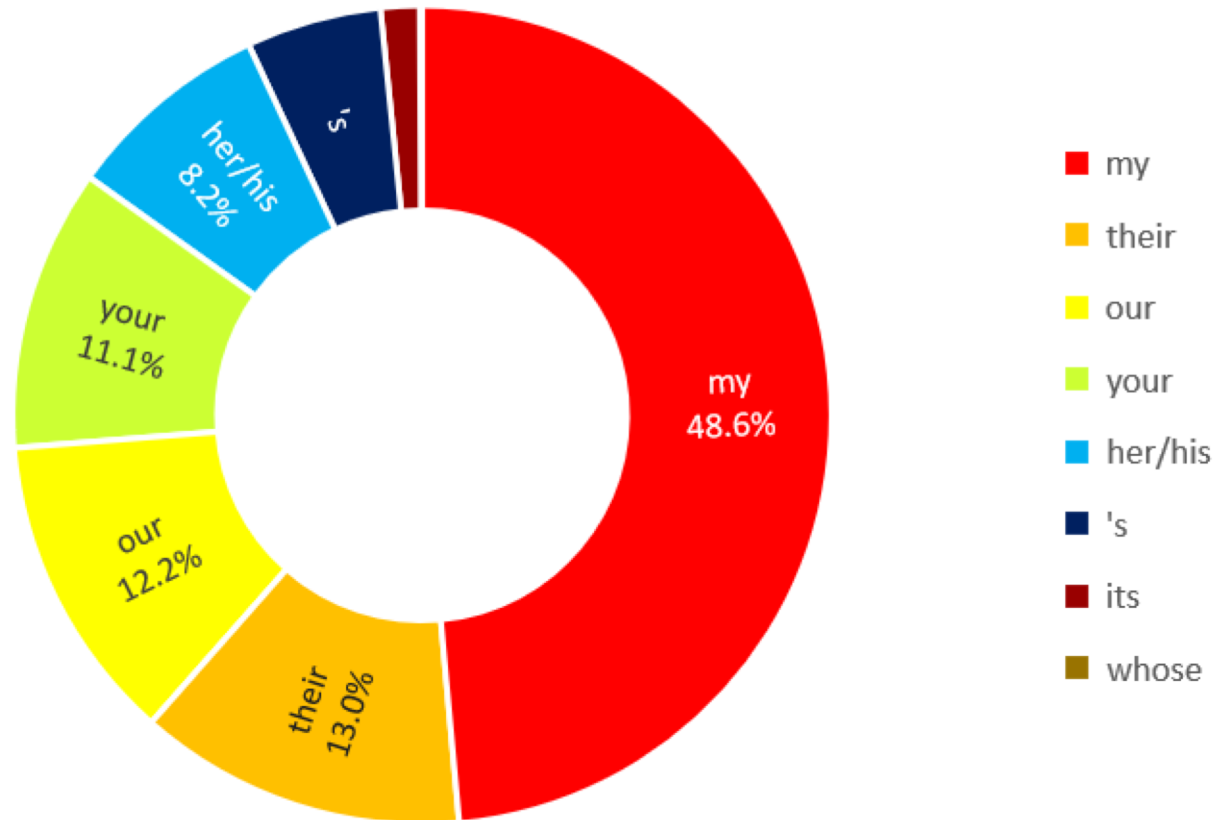
Characteristic, ComparisonRef, Cost, Extent, Identity, Instrument, Manner, Possession, Quantity, Species, Stimulus, Stuff, and Topic.

- Supersenses only attested for 's and possessive prepositions:

Beneficiary, Duration, Recipient, and perhaps most interestingly Possessor.

# Results

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Supersense	(Tratz and Hovy, 2013)	(Badulescu and Moldovan, 2009)	example
Agent	Subjective	Agent	<b>her</b> help
Beneficiary	Recipient	Recipient	children's clothes
Causer	Producer's Product	Cause	victim <b>of</b> hard times
Characteristic		Property	a place <b>of</b> beauty
ComparisonRef			the opposite <b>of</b> QuikTrip
Cost	Extent	Measure	a price <b>of</b> \$160
⋮			⋮
Quantity		Measure	plenty <b>of</b> parking
Recipient	Recipient	Recipient	<b>my</b> delivery
SocialRel	Kinship, Member's Collection, Other Relational Noun	Kinship	<b>her</b> brother, <b>her</b> family <b>her</b> friend
Species			that kind <b>of</b> behavior
Stimulus		Stimulus	a fear <b>of</b> snakes
Stuff			the piece <b>of</b> metal
⋮			⋮

Some labels with no equivalent:

ComparisonRef, Manner, Species, Stuff

# Possessive Multiword Expressions

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s-genitive MWEs

*try [one]’s best*

*be quick on [one]’s feet*

*be on [one]’s own*

of-genitive MWEs

***of** course*

*out **of** business*

*time **of** need*

Agrees with subject (*\*I tried Mary’s best*)

# Conclusions & Future Work

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Our ACL Paper:

Nathan Schneider, Jena D. Hwang, Vivek Srikumar, Jakob Prange, Austin Blodgett, Sarah R. Moeller, Aviram Stern, Adi Bitan and Omri Abend. 2018. **Comprehensive Supersense Disambiguation of English Prepositions and Possessives**. In Proc. of ACL.

# Conclusions & Future Work

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- Corpus release: <http://tiny.cc/streusle>
  - **1,104 s-genitive** tokens annotated NEW
  - **509 of-genitive** tokens annotated
  - Comprehensive annotation
- A semantic annotation scheme designed for adpositions can be applied to English possessive constructions.
- The semantic distributions of s-genitive and of-genitive diverge

# Thank you

Corpus: <http://tiny.cc/streusle>

# References

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- Francis Bond, Jia Qian Ho, and Daniel Flickinger. 2015. **Feeling our way to an analysis of English possessed idioms**. In Proc. of HPSG. Singapore, pages 61–74.
- Jena D. Hwang, Archana Bhatia, Na-Rae Han, Tim O’Gorman, Vivek Srikumar, and Nathan Schneider. 2017. **Coping with construals in broad-coverage semantic annotation of adpositions**. arXiv:1703.03771 [cs.CL] arXiv: 1703.03771. <http://arxiv.org/abs/1703.03771>.
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- Nathan Schneider, Vivek Srikumar, Jena D. Hwang, and Martha Palmer. 2015. **A hierarchy with, of, and for preposition supersenses**. In Proc. of The 9th Linguistic Annotation Workshop. Denver, Colorado, USA, pages 112–123.
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- Stefanowitsch, Anatol (2003). **Constructional semantics as a limit to grammatical alternation: The two genitives of English**. Topics in English Linguistics, 43:413–444.
- Stephen Tratz and Eduard Hovy. 2013. **Automatic interpretation of the English possessive**. In Proc. of ACL. Sofia, Bulgaria, pages 372–381.

A1 / A2	AGENT	BENEFICIARY	CHARACTERISTIC	EXPERIENCER	GESTALT	ORGRLE	ORIGINATOR	PART/PORTION	POSSESSION	POSSESSOR	RECIPIENT	SOCIALREL	SOURCE	THEME	WHOLE
AGENT	9		1				3			2				1	
BENEFICIARY				1											
EXPERIENCER				4										1	
GESTALT					2								2		
ORIGINATOR					1		8								
POSSESSOR		1	2	1	2		1		2	22					
SOCIALREL	1				1	1	1	1		3	1	21			
THEME											1				
WHOLE															12

**Table 3:** Interannotator confusion matrix for s-genitives.

- I have many fond memories **of** my college evenings (Possessor vs. Experiencer)
- This one won't be getting **my** business (Originator vs. Agent)
- Jane 's knowledge of the subject matter (Possessor vs. Experiencer vs. Gestalt)