Span- and Dependency-based Multilingual and Cross-lingual Semantic Role Labeling for SemEval 2021

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SemEval 2021

Main contribution

A novel multilingual parallel dataset in 6 languages tailored for the use of transfer learning techniques in both span-based and dependency-based Semantic Role Labeling (SRL).

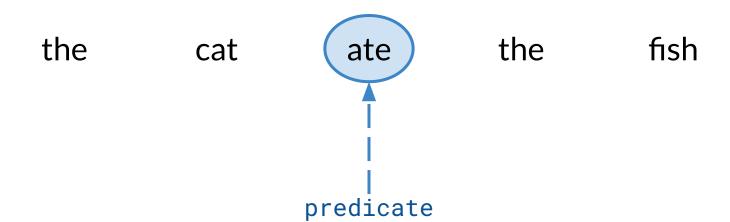


Who did what to whom?

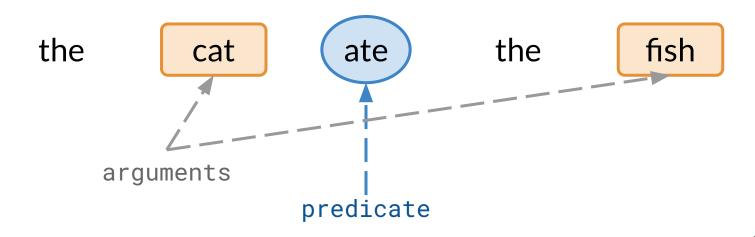
the cat ate the fish



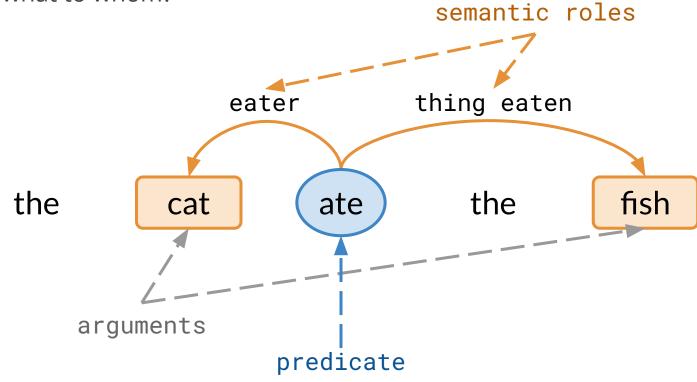
Who did what to whom?



Who did what to whom?



Who did what to whom?



Who did what to whom? semantic roles thing eaten eater the the fish cat ate Dependencyarguments based SRL predicate

Who did what to whom? semantic roles thing eaten eater the the fish cat ate Span-based arguments SRL predicate

What is needed?

A verbal repository (VerbAtlas)



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- A verbal repository (VerbAtlas)
- A semantic roles repository (VerbAtlas)



What is needed?

- A verbal repository (VerbAtlas)
- A semantic roles repository (VerbAtlas)
- An annotated corpus (United Nations Parallel Corpus)

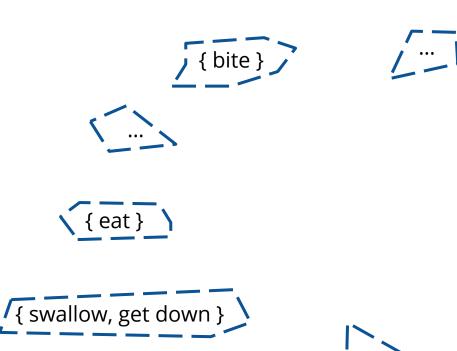


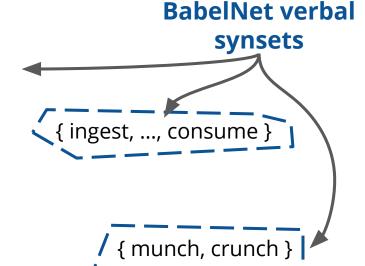
Introducing VerbAtlas



Manual Clustering of Predicates

Creating clusters of BabelNet verbal synsets







Manual Clustering of Predicates

Creating hand-made clusters of BabelNet verbal synsets

WordNet verbal synsets { bite } { ingest, ..., consume } similar **SCENES** and { eat } / { munch, crunch } **PARTICIPANTS** to the action { swallow, get down } { dine }

Manual Clustering of Predicates

Creating clusters of BabelNet verbal synsets

```
{ ingest, ..., consume }

... { bite } ...

{ eat } ...

{ dine }

{ swallow, get down }

{ munch, crunch }

EAT-BITE
```



Frames in VerbAtlas

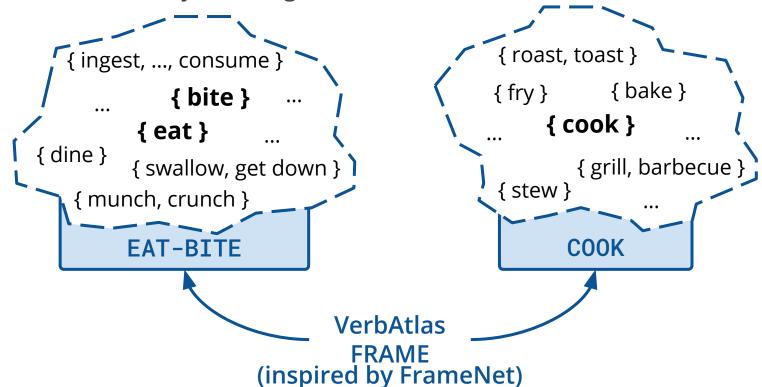
All BabelNet verbal synsets organized into 426 semantic frames

```
{ ingest, ..., consume }
         { bite }
      { swallow, get down }
{ munch, crunch }
     EAT-BITE
                         VerbAtlas
                          FRAME
                 (inspired by FrameNet)
```

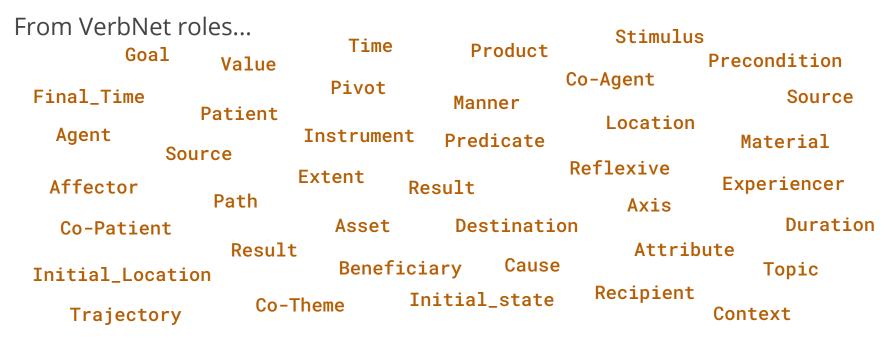


Frames in VerbAtlas

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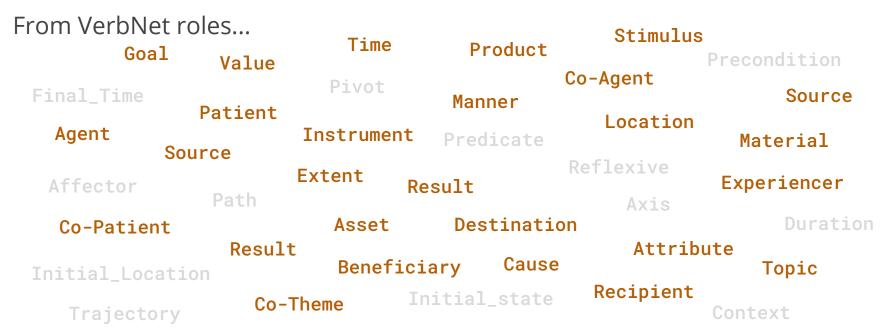


Semantic Roles: from VerbNet to VerbAtlas





Semantic Roles: from VerbNet to VerbAtlas





Prototypical Argument Structures in VerbAtlas

Frame-level organization for Semantic Roles

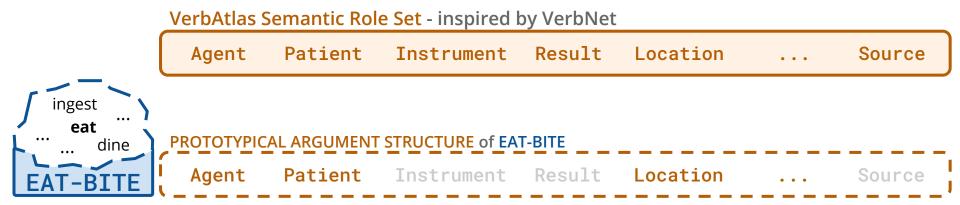
VerbAtlas Semantic Role Set - inspired by VerbNet

Agent Patient Instrument Result Location ... Source



Prototypical Argument Structures in VerbAtlas

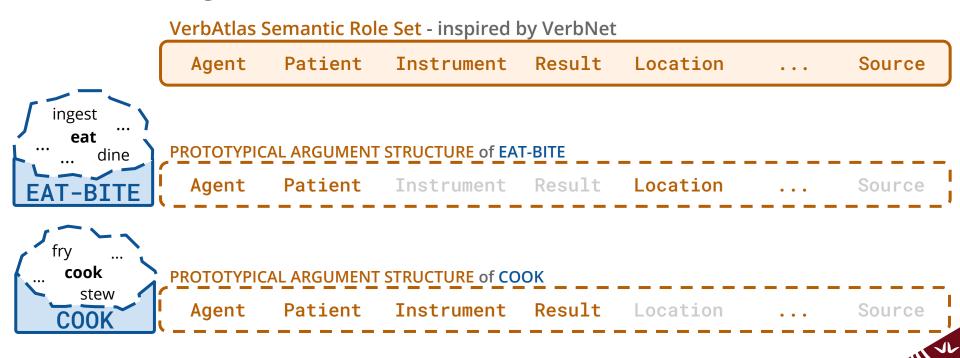
Frame-level organization for Semantic Roles



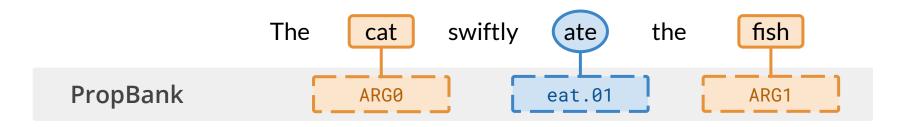


Prototypical Argument Structures in VerbAtlas

Frame-level organization for Semantic Roles



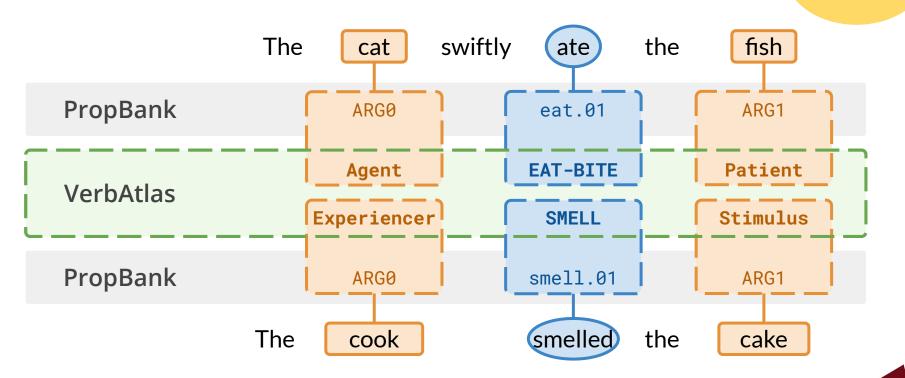
PropBank vs VerbAtlas





PropBank vs VerbAtlas



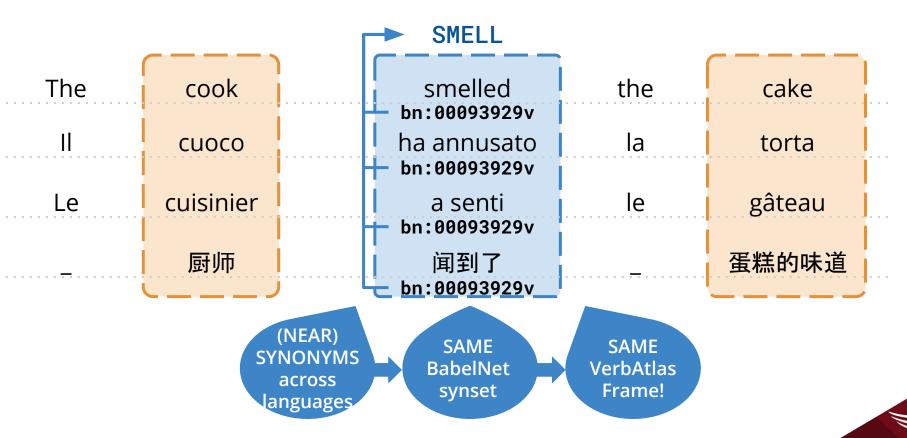


Easy Multilinguality with BabelNet

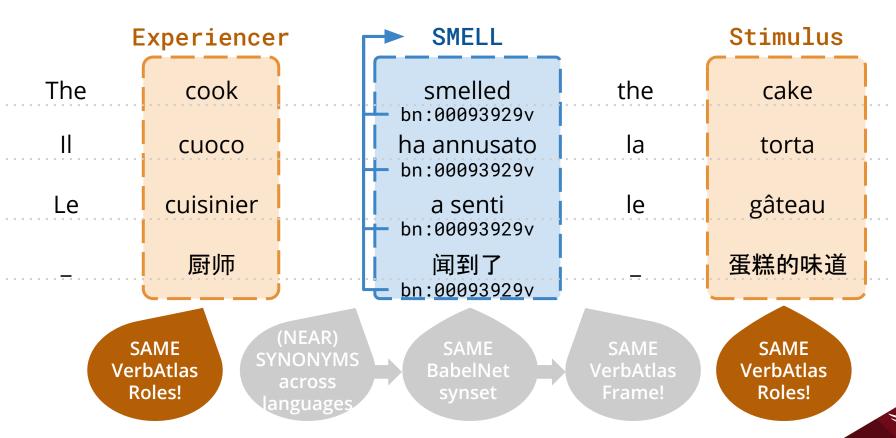
smelled The cook the cake ha annusato la torta cuoco gâteau cuisinier Le a senti le 蛋糕的味道 厨师 闻到了



Easy Multilinguality with BabelNet



Easy Multilinguality with BabelNet





A comparison with previous CoNLL tasks

	CoNLL-2009	CoNLL-2012	SemEval-2021
Туре	Dependency	Span	Both
Multilinguality			
Language alignment			
Size			
Domain distribution			
Inventories			
Fine-grained annotations			

A comparison with previous CoNLL tasks

	CoNLL-2009	CoNLL-2012	SemEval-2021
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Size			
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Inventories	Various	PropBank style	VerbAtlas
Fine-grained annotations	No	No	For Predicates and arguments

Introducing The Dataset



United Nations parallel corpus

- Official documents translated by professional translators
- 6 languages (English, Chinese, French, Spanish, Russian and Arabic)
- 11 millions sentences par language
- 86,000 documents
- 10 selected different tagged domains (to avoid specialization like other datasets we used the 10 most frequent domains)



The Dataset

	Training	Development	Test
English	15,000		
Chinese	Χ		
Spanish	Χ		
French	Χ		
Russian	X		
Arabic	X		

The Dataset

	Training Developmen		Test
English	15,000	1,500	
Chinese	Χ	1,500	
Spanish	Χ	1,500	
French	Χ	1,500	
Russian	X	1,500	
Arabic	X	1,500	

The Dataset

	Training	Development	Test	
English	15,000	1,500	2,000	
Chinese	Χ	1,500	2,000	
Spanish	Χ	1,500	2,000	
French	Χ	1,500	2,000	
Russian	X	1,500	2,000	
Arabic	X	1,500	2,000	

Some information

Verbs annotated with VerbAtlas frames and synsets



- Verbs annotated with VerbAtlas frames and synsets
- Arguments annotated with synsets



- Verbs annotated with VerbAtlas frames and synsets
- Arguments annotated with synsets
- Tokenization (+ multiword expressions), Universal POS,
 Syntactic Dependencies (automatically done with Stanza Library (Qi et al. 2020))



Annotation example

A	В	C	D	E	\mathbf{F}	G	Н	I	J
doc1sent1tok1	Не	Не	PRON	NSUBJ	3	bn:01555927n	10 <u>1</u> 20	2	AGENT*
doc1sent1tok2	had	have	AUX	AUX	3	-	AUXILIARY	-	
doc1sent1tok3	established	establish	VERB	ROOT	0	bn:00084200v	ESTABLISH	-	· ·
doc1sent1tok4	the	the	DET	DET	5	·	=	-	THEME
doc1sent1tok5	post	post	NOUN	OBJ	3	bn:00010073n		_	THEME*
doc1sent1tok6	of	of	ADP	CASE	7	829	8 <u>2</u> 8	23	THEME
doc1sent1tok7	Secretary_	Secretary	PROPN	NMOD	5		-	-	THEME
doc1sent1tok8	of_	of	ADP	CASE	9	5-1	-	-	THEME
doc1sent1tok9	State	State	PROPN	NMOD	7	-	-	-	THEME
doc1sent1tok10			PUNCT	PUNCT	3	-	2		(2)

SAPIENZA

Annotation example

Multilingual example



SAPIENZA

Introducing The subtasks and evaluation



Subtask-1

Monolingual SRL

- Training a system on the English training set
- Evaluation on the English Test set



Subtask-2

Cross-lingual SRL

- Training a system on the English training set
- Evaluation on all the 6 languages
- We encourage participants to transfer knowledge from high- to low-resource languages



1. Predicate labeling:

- a. Predicate identification (F1)
- b. Predicate disambiguation(F1)



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2. Argument Labeling:

- a. Argument identification (F1)
- b. Argument classification (F1)



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 Span- and dependency-based systems are evaluated separately



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- a. Predicate identification (F1)
- b. Predicate disambiguation (F1)

2. Argument Labeling:

- a. Argument identification (F1)
- b. Argument classification (F1)

- Span- and dependency-based systems are evaluated separately
- Otherwise we will measure them with the harmonic mean of the results of both environment for argument labeling



We provide a multilingual dataset in 6 parallel languages



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- Automatically tokenized, lemmatized, POS tagged, dependency tagged



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- Manual annotation of span- and dependency-based SRL with the novel multilingual verbal resource VerbAtlas



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- Manual semantic annotations of verbs, arguments, multiword expressions and semantic roles



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- Manual annotation of span- and dependency-based SRL with the novel multilingual verbal resource VerbAtlas
- Manual semantic annotations of verbs, arguments, multiword expressions and semantic roles
- In order to solve heterogeneity issues of previous tasks



VerbAtlas is online! Check it out at:

http://verbatlas.org

Thank you!









