Automatic prediction of aspectual class of verbs in context

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CLUSTER OF EXCELLENCE

Aspectual class of verbs in context

She **filled** the glass with juice. *(dynamic)*
'something happens'

The juice **fills** the glass. *(stative)*
'something is the case'

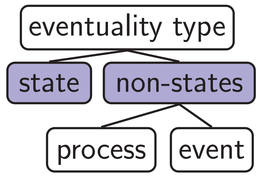
The glass was **filled** with juice.
(both readings possible)

Linguistic background & task

Vendler (1957): time schemata of **verbs** (*lexical aspect/aktionsart*)

states	*love, own*	**stative**
activities	*run*	**dynamic**
accomplishments	*write a letter*	
achievements	*realize*	

Bach (1986): **sentences**



Task: predict **fundamental aspectual class**

John will **love** this cake!	(*stative*)
John has **kissed** Mary.	(*dynamic*)
John **drives** to work.	(*dynamic*)

Siegel&McKeown (2000)

Method

LCS verb type seed sets
- *stative* (188): belong, cost,...
- *dynamic* (3760): alter, knock,...
- *both* (215): fill, stand, take,...

syntax-based distributional model (Thater et al. 2011)

The thrift holding company **said**	*dynamic*
it **expects** to obtain approval	*stative*
and **recognizes** the danger.	*both*

parsed, unlabeled background corpus (GigaWord)

distributional features (**Dist**)
avg. similarities with verbs in seed sets

linguistic indicators (**LingInd**)

past/present tense	frequency	perfect
progressive	negation	particles
in-PP	for-PP	no subject
temp./manner/evaluation/contin. adverbs		

verb type based

labeled clauses

instance-based features (**Inst**)

clause

Random Forest classifier

dynamic
stative
both

Type-based features

Linguistic indicators (LingInd)

verb type: `fill`
feature: `temporal-adverb`
value: 0.0085

⇒ 0.85% of the occurrences of *fill* are modified by one of the temporal adverbs.

Distributional features (Dist)

verb type: `fill`
sim. with *stative*: 0.31
sim. with *dynamic*: 0.27
sim. with *both*: 0.16

Instance-based features (Inst)

A little girl had just **finished** *her first week of school.*

`tense:`*past*	`progressive:`*false*
`pos:`*VBD*	`dobj:`*noun.time*
`perfect:`*true*	`particle:`*none*
`voice:`*active*	`subj:`*noun.person*

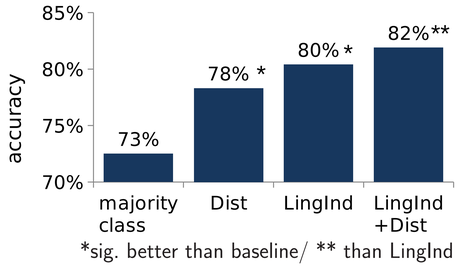
Experiments, results & conclusions

Data → freely available
- Asp-MASC: 6161 clauses (complete texts) excluding *be/have*, 2 annotators, $\kappa = 0.7$
- Asp-Ambig: 2667 sentences for 20 frequent ambiguous verbs, 2 annotators, $\kappa = 0.6$

Experiment 1: Seen verbs (labeled training data available)

Type-based features → same accuracy (84%) as only using **Lemma** of main verb as feature (= memorizing most frequent class per verb)

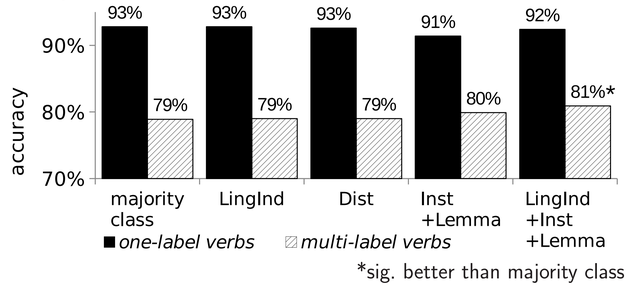
Experiment 2: Unseen verbs



*sig. better than baseline/ ** than LingInd

Type-based features generalize across verb types.

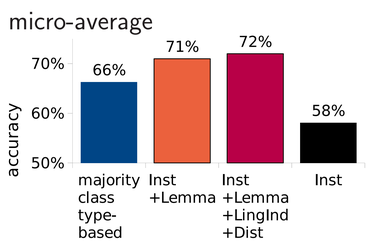
Experiment 3: One-label vs. multi-label

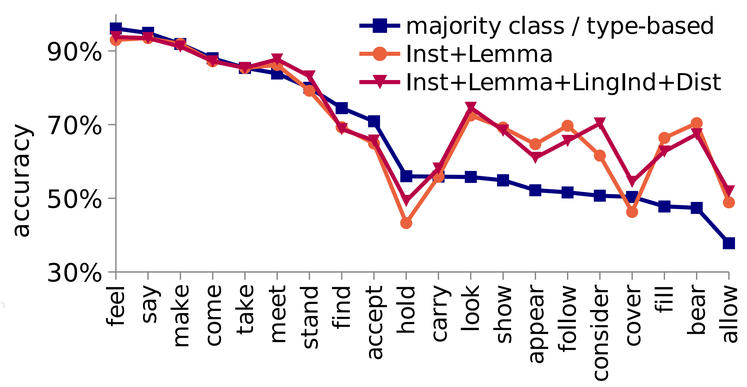


*sig. better than majority class

Instance-based features are essential for classifying ambiguous verbs.

Experiment 4: Instance-based
- Asp-Ambig





- Instance-based features do not generalize across verb types.
- The more ambiguous the verb, the more essential are instance-based features.
- Type-based features (bias) helpful? → depends on verb type

Future work

multi-stage approach: treat verbs according to their aspectual class distribution
→ bigger picture: improve (temporal) discourse processing

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