Concepts

Following https://plato.stanford.edu/entries/tense-aspect/

▶ Event

> The engine broke down

▶ State

> The engine is still not working

▶ Process

> They are rebuilding the engine

▶ Sometimes just combined into events

▶ Sometimes just combined into events and states

▶ In modern theories, events compose into bigger events

  ▶ Rebuilding = Dismantling ⊙ Repairing ⊙ Assembling

Tense

▶ Tense: when
  ▶ An event occurs
  ▶ A state holds
  ▶ A process proceeds

▶ Absolute (really, relative to the present)

> The engine broke down
> I regret to inform you the engine broke down
> We will make the engine great again

▶ Relative (to some time)

> The engine will have been fixed next week

Reichenbach's Model
Interplay of three components

- ▶ Event time
- ▶ Reference time
- ▶ Speech time

E, R, S	Sam is working
S – E, R	Sam will work
E, R – S	Sam worked
E – R – S	Sam had worked
S – E – R	Sam will have worked
R – E – S	Sam would (go on to) work

- ▶ Enhancements needed for more complex sentences
  Sam would have worked

Aspectual Classes or Aktionsarten

The internal structure of an event (Vendler, building on Aristotle's)

- ▶ State

  > She's happy today

- ▶ Achievement: transition into a state

  > She received an award
  >
  > She is completing her project

- ▶ Activity: indefinite ending

  > She is studying Haskell
  >
  > She is writing code

- ▶ Accomplishment: definite result state

  > She is implementing a new parser

- ▶ Semelfactive (Comrie, Carlota Smith), e.g., *sneeze*, *knock*

  > Her product exploded the whole market

Grammatical Tests to Distinguish the Aspects

▶ Statives don't work with progressives

*She's being happy today

She's receiving an award today

She is completing her project

▶ Achievements can work with *in* but not with *for* adverbials

She won an award in two days

*She won an award for two days (invites a different reading)

She reached the peak of her profession in two years

*She reached the peak of her profession for two years

▶ Accomplishments work with *in* and sometimes *for* adverbials

She implemented a parser in two days

She implemented a parser for two days

▶ Activities work with *for* but not with *in* adverbials

*She wrote code in two days

She wrote code for two days

Event Nucleus
Moens and Steedman

- ▶ An event notionally has three components
  - ▶ Preparatory phase
  - ▶ Culminating event
  - ▶ Consequent phase
- ▶ Event types reference components of the nucleus differently

	Preparatory phase	Culminating event	Consequent phase
State	no	no	yes
Achievement	no	yes	no
Activity	yes	no	no
Accomplishment	yes	yes	yes

How about semelfactives?

Lexical or Grammatical?

- ▶ Vendler claimed it's lexical
    - ▶ A verb has a fixed *aktionsart*

    > She completed her project
    > *She completed her project all night

- ▶ Can coerce an achievement into an activity

    > Students completed their projects all night

- ▶ Can coerce a state into an activity

    > She is resembling her mother more and more every day

- ▶ Iteration

    > Miranda played *Hamilton* for two years

Relation to Noun Phrases: Graduality and Telicity
Manfred Krifka

▶ Part-whole relation (recall mereology)
  ▶ Referents of NPs: objects
  ▶ Referents of VPs: events (broadly)

▶ Cumulative reference
  ▶ Predicate for parts holds for whole

beer		drink beer
code		write code

▶ Quantized reference
  ▶ Predicate for whole doesn't hold for parts

bottle of beer		drink a bottle of beer
method (as in code)		write a method

Entailments

Dowty, 1979: imperfective "paradox"

▶ Some entailments hold

> She was writing code
> $\Rightarrow$
> She wrote code

▶ Some entailments fail

> She was implementing a parser
> $\not\Rightarrow$
> She implemented a parser

Temporal and Aspectual Entailment

Kober, de Vroe, Steedman, 2019

Jane has arrived in London

$\Rightarrow$

Jane is in London now

Jane will arrive in London

$\not\Rightarrow$

Jane is in London now

Jane has gone to London

$\Rightarrow$

Jane is in London now

Jane had gone to London

$\not\Rightarrow$

Jane is in London now

(but we get)

Jane was in London

Temporal and Aspectual Entailment

Jane went to London
$\not\Rightarrow$
Jane is in London now
(but we get)
Jane was in London

Jane was walking in the woods
$\Rightarrow$ Jane walked in the woods

Jane was implementing a parser
$\not\Rightarrow$ Jane implemented a parser

George has acquired the house
$\Rightarrow$ George owns the house

George is acquiring the house
$\not\Rightarrow$ George owns the house

Temporal Entailment Assessment Dataset

- ▶ Dataset of ∼11,000 sentence pairs sampled from VerbOcean (before-after category) and WordNet verb entailment
- ▶ Filtered to remove verb pairs not temporally related
  - ▶ 22% labeled entailment
  - ▶ 78% labeled nonentailment
- ▶ Methods
  - ▶ Variants of ELMo, BERT, . . .
  - ▶ Baselines: majority and majority with respect to tense pair

Model	Average Precision	Accuracy	F_1 Score
Majority class	0.22	0.78	0.44
Majority class per tense pair	0.35	0.80	0.66
Every other method	≤ 0.31	≤ 0.58	≤ 0.49

Challenge for you