En effet: Towards Neural Semantic Role Labeling with French LTAG for the Causation Frame

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What is this talk about?

- Neural Semantic Role Labeler which jointly predicts predicates and arguments for the Causation frame of the French FrameNet.
- LTAG supertag features.

- **Today we are presenting:**

  → Span-graph based method for predicting all the predicates and their arguments in a sentence (He et al., 2018).

  → Causation frame, typical frame-evoking elements and corresponding supertags.

  → Some issues we encountered: embedded roles, *Other_sense* frame.

Some statistics on French FrameNet

- ⋆ 136 semantic roles in 105 frames.
- ⋆ 4 notational domains: Causality, Cognitive positions, Commercial transactions, and Verbal communication.
- ⋆ 1109 distinct senses (frame/lemma+cat pairs).
- ⋆ 16167 annotation sets.

frame	annot. occ.	domain	frame_elements	nb lexical units
Other_sense	8755	OTHER		519
Causation	1623	CAUSE	Actor, Affected, Cause, Effect	100
FR_Statement-manner-noise	1527	COM_LANG	Addressee, Medium, Message, Speaker, Topic	59
FR_Awareness-Certainty-Opinion	1290	COG_POS	Cognizer, Content, Evidence, Topic	76
Evidence	790	CAUSE	Cognizer, Proposition, Support	76

Some statistics on French FrameNet

- 29 suggested macroroles.
- We will use this set of semantic roles for SRl.

1	All_addressees
2	All_cognizers
3	All_speakers
4	Content_or_entity
5	Beneficiary
6	Cause
7	Cause_actor
8	Effect
9	Entity_predicated_on
10	Evaluee
11	Evidence
12	Goods
13	Instrument
14	Means
15	Medium
16	Message
17	Message_content
18	Money
19	Money_giver
20	Money_recipient
21	Name
22	Named_entity
23	Polarity
24	Rate
25	Reason_of_judgment
26	Reason_of_legitimacy
27	Time_of_eventuality
28	Topic
29	Unit

Statistics on lexical units (LUs) evoking frames

POS	number
verb	504
noun	336
adjective	53
preposition	45
adverb	35
conjunction	25
coordinating conjunction	5
foreign word	4
determiner	2

Embedded semantic roles

	token	lemma	head	supertag	frame and roles #1	frame and roles #2	frame and roles #3
1	Déjà	déjà	12	(SENT* (ADV <>))	O	Message	O
2	,	,	12	(SENT* (PONCT <>))	O	Message	O
3	en	en	12	(SENT* (PP (P <>) (NP)))	O	Message	O
4	1990	1990	3	(NP (N <>))	O	Message	O
5	,	,	12	(SENT* (PONCT <>))	O	Message	O
6	40	40	7	(NP* (D <>))	O	Message	O
7	%	%	12	(NP (N <>))	O	Message	O
8	des	de	7	(NP* (PP (P <>) (NP)))	O	Message	O
9	unités	unité	8	(NP (N <>))	O	Message	Goods
10	vendues	vendre	9	(NP* (VPpart (V <>)))	O	Message	3#Commerce_sell#Buyer=UNI#Seller=UNI
11	étaient	être	12	(VN* (V <>))	O	Message	O
12	destinées	destiner	0	(ROOT (SENT (NP) (VN (V <>)) (PP)))	O	Message	O
13	à	à	12	(PP (P <>) (VPinf))	O	Message	O
14	renouveler	renouveler	13	(VPinf (VN (V <>)) (NP))	O	Message	O
15	le	le	16	(NP* (D <>))	O	Message	O
16	matériel	matériel	14	(NP (N <>))	O	Message	O
17	existant	existant	16	(NP* (AP (A <>)))	O	Message	O
18	,	,	19	(Sint* (PONCT <>))	O	O	O
19	souligne	souligner	12	(SENT* (Sint (VN (V <>)) (NP)))	O	2#Convey_importance	O
20	l'	le	21	(NP* (D <>))	Speaker	Speaker	O
21	INSEE	INSEE	19	(NP (N <>))	Speaker	Speaker	O
22	qui	qui	21	(NP* (Srel (NP (PRO <>)) (VN) (NP)))	Speaker	Speaker	O
23	cite	citer	22	(VN (V <>))	1#FR_Quoting: role Speaker	Speaker	O
24	une	un	25	(NP* (D <>))	Source_medium--Speaker	Speaker	O
25	enquête	enquête	22	(NP (N <>))	Source_medium--Speaker	Speaker	O
26	de	de	25	(NP* (PP (P <>) (NP)))	Source_medium--Speaker	Speaker	O
27	la	le	28	(NP* (D <>))	Source_medium--Speaker	Speaker	O
28	société	société	26	(NP (N <>) (N))	Source_medium--Speaker	Speaker	O
29	d'	de	28	(NP* (PP (P <>) (NP)))	Source_medium--Speaker	Speaker	O
30	études	études	29	(NP (N <>))	Source_medium--Speaker	Speaker	O
31	spécialisées	spécialisé	30	(NP* (AP (A <>)))	Source_medium--Speaker	Speaker	O
32	IDC	IDC	28	(N <>)	Source_medium--Speaker	Speaker	O
33	.	.	12	(SENT* (PONCT <>))	O	O	O

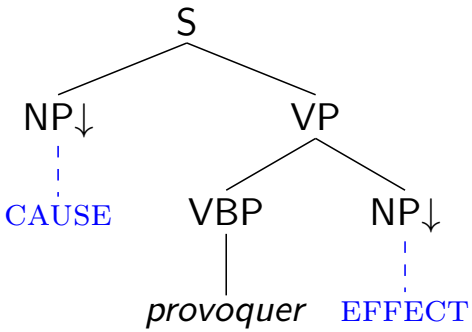
Causation frame

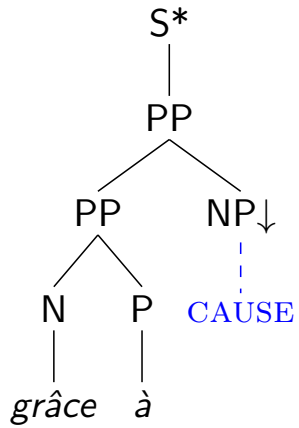
- ⋆ *Causation*-frame is the most frequent frame (1623 annotated occurences) with the highest number of lexical units (519 lexical units).
  → 3 core frame elements: *Actor*, *Cause*, *Effect*;
  → 1 non-core frame element: *Affected*.

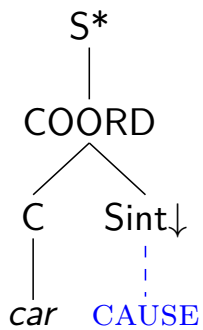
	token	lemma	head	supertag	frame and roles #1
11	l'	le	12	(NP* (D <>))	Cause
12	automatisation	automatisation	14	(NP (N <>))	Cause
13	ne	ne	14	(VN* (ADV <>))	O
14	provoque	provoquer	0	(ROOT (SENT (NP) (VN (V <>) (NP))))	1#Causation
15	pas	pas	14	(SENT* (ADV <>))	O
16	de	un	17	(NP* (D <>))	Effect
17	changement	changement	14	(NP (N <>))	Effect
18	de	de	17	(NP* (PP (P <>) (NP)))	Effect
19	la	le	20	(NP* (D <>))	Effect
20	division	division	18	(NP (N <>))	Effect
21	du	de	20	(NP* (PP (P <>) (NP)))	Effect
22	travail	travail	21	(NP (N <>))	Effect
23	.	.	14	(SENT* (PONCT <>))	O

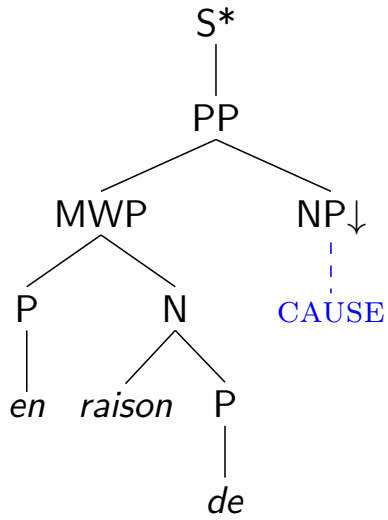
Causation frame

- ⋆ The most frequent lexical units (predicates): *provoquer.v* (86), *en raison de.prep* (79), *conséquence.n* (78), *rendre.v* (62), *entraîner.v* (55), *parce que.conj* (54), *grâce à.prep* (51) etc.
- ⋆ Typical supertags for the predicate of the *Causation*-frame:





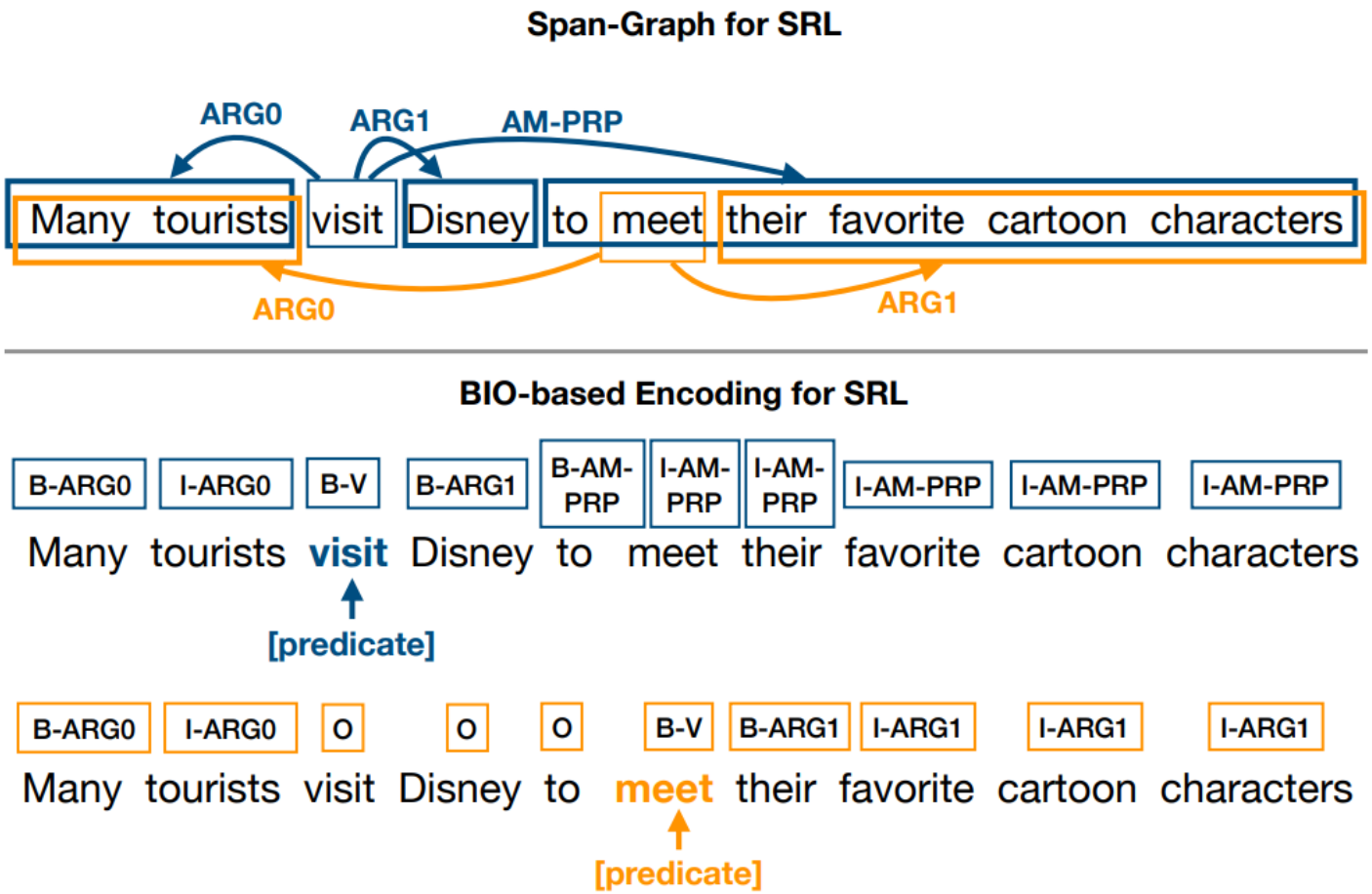




LTAG-based features for SRL (Liu, 2009; He et al., 2018)

- ⋆ Combine the LTAG-based SRL approach described in Liu (2009) with the joint prediction of semantic roles described in He et al. (2018).
- ⋆ He et al. (2018) in a nutshell:
  → span-based neural end-to-end approach which jointly predicts all predicates, argument spans, and the relations between them.
- ⋆ Liu (2009) in a nutshell:
  → use linguistic features provided by the LTAG-spinal for better SRL.

Joint prediction of predicates and arguments He et al. (2018)



Joint prediction of predicates and arguments in neural SRL (He et al., 2018)

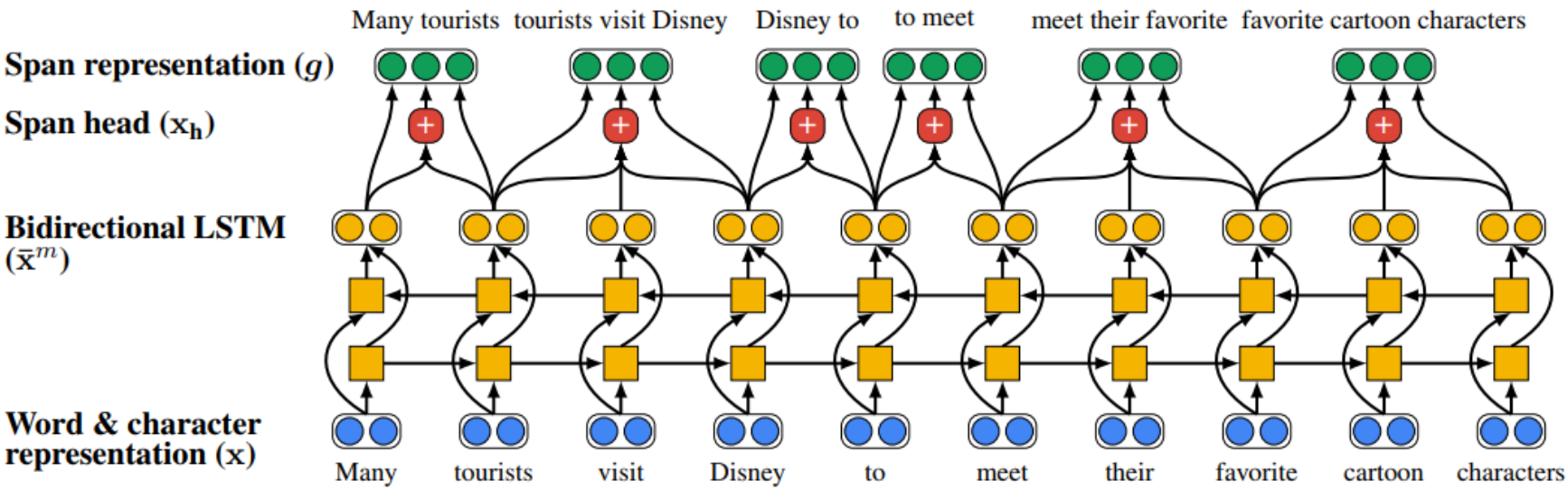
Joint prediction of predicates and arguments: features

	token	pos	predicate	head	supertag	constituents	semantic roles
1	Pourquoi	ADVWH	pourquoi	0	(ROOT (SENT (VPinf (ADV <>) (VN) (NP))))	(ROOT(SENT(VPinf*	(Pred*)
2	avoir	VINF	-	4	(VN* (V <>))	(VN*	(Effect*
3	donc	ADV	-	4	(VN* (ADV <>))	*	*
4	créé	VPP	-	1	(VN (V <>))	*)	*
5	un	DET	-	9	(NP* (D <>))	(NP*	*
6	tel	ADJ	-	9	(NP* (AP (A <>)))	*	*
7	remue	VPP	-	9	(V <>)	(NP*	*
8	-	PONCT	-	9	(NP* (PONCT <>))	*	*
9	ménage	NC	-	1	(NP (NP (V) (N <>)))	*)))	*
10	?	PONCT	-	1	(SENT* (PONCT <>))	*))	*)

Joint prediction of predicates and arguments: current features

Joint prediction of predicates and arguments: model

- ⋆ Predictions: tuples of ⟨ predicate, argument span, label ⟩.
- ⋆ Around 40 semantic roles in ProbBank style (ARG0, ARG1, ARG-TMP etc.).



Joint prediction of predicates and arguments: neural model (He et al., 2018)

Baseline results for English SRL (He et al., 2018)

End-to-End	**CoNLL 05 Dev F1** In-domain (WSJ)	**Out-of-domain** (Brown)	**CoNLL 2012** (OntoNotes)
He et al. (2018)	86.0	76.1	82.9
He et al. (2017)	82.7	70.1	79.8

Table: F1 score on dev set for different SRL domains (English).

Additional features from predicted LTAG supertags to try out

- ⋆ tree families;
- ⋆ direction of the head of the word + obligatory arguments;
- ⋆ relation of argument to predicate elementary tree (child, parent, sibling, grandparent, other);
- ⋆ position of the elementary tree to the head;
- ⋆ distance between the elementary tree and its head;
- ⋆ label and index of the attachment site (possible thanks to Partage);
- ⋆ up to 9 trigrams of the predicate elementary tree spine (from the predicate leaf).

Issues and future work

- Training takes a long time (two to three days)
  $\rightarrow$ ELMO-embeddings.
- Many different kinds of predicate supertags for one and the same frame.
- The frame-evoking elements have many possible POS-tags.
- Embedded roles in French FrameNet.

- **Future work:**
- Run experiments on the data for Causation frame (train (991 sentences), dev (98 sentences), test (110 sentences))
- Add different features coming from supertags.
- Prepare data for other frames and run experiments with them.

Thank you!

THANK YOU VERY MUCH FOR YOUR ATTENTION!

References I

He, L., Lee, K., Levy, O., and Zettlemoyer, L. (2018). Jointly predicting predicates and arguments in neural semantic role labeling. *arXiv preprint arXiv:1805.04787*.

He, L., Lee, K., Lewis, M., and Zettlemoyer, L. (2017). Deep semantic role labeling: What works and what's next. In *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 473–483.

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