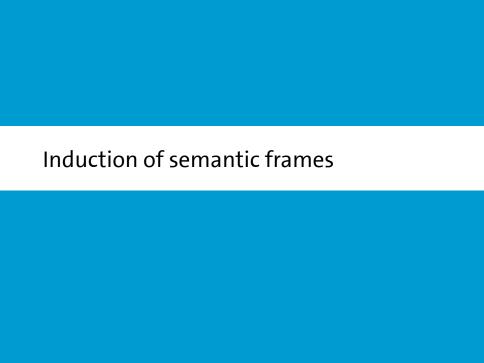


Alexander Panchenko

FROM UNSUPERVISED INDUCTION OF LINGUISTIC STRUCTURES FROM TEXT TOWARDS APPLICATIONS IN DEEP LEARNING



FrameNet: frame "Kidnapping"

Definition:

The words in this frame describe situations in which a Perpetrator carries off and holds the Victim against his or her will by force.

Two men KIDNAPPED a Millwall soccer club employee, police said last night.

Not even the ABDUCTION of his children by Captain Hook and his scurvy sidekick, Smee, can shake Peter's scepticism.

FEs:

Core:

Perpetrator [Perp]
Semantic Type: Sentient

The Perpetrator is the person (or other agent) who carries off and holds the Victim against his or her will.

Victim [Vict]
Semantic Type: Sentient
Non-Core:

The Victim is the person who is carried off and held against his/her will.

Co-participant [Co-p]

An additional abductee taken along with the Victim.

She was ABDUCTED with her brother.



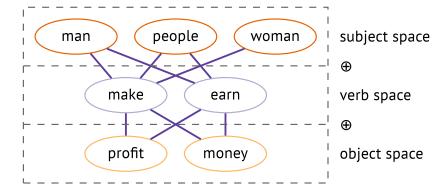
Frame induction as a triclustering

ACL'2018 [Ustalov et al., 2018]

Example of a LU tricluster corresponding to the "Kidnapping" frame from FrameNet.

FrameNet	Role	Lexical Units (LU)
Perpetrator	Subject	kidnapper, alien, militant
FEE	Verb	snatch, kidnap, abduct
Victim	Object	son, people, soldier, child

SVO triple elements



An SVO triple graph

	Mayorllead city	
	Governor Lead state	
General command	d Department mayor lead	
	president/lead/state 1	
President chair comm		
Gen	eral command department	
General head Department	president lead government	chairman lead company
PresidentIchairlCommit		ad department
	president lead department	
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	minister lead team Directo	
	lldepartment director lead depa	
	t Chairman lead Committee	
Minister head government Di	epartment Director Lead d	
president chair committee	chairman lead committee	officer lead company
	headIdepartment	
presidentineadinovernment		PR DOME TREE TO THE TREE TO THE TREE TREE TO THE TREE TREE TREE TREE TREE TREE TREE
oresident chair Committee leader I	nead government director head di	leader head party boss lead company
director chair commit	tee Chairman chair Committee	officerlheadIteam
(th	airman chair committee Direct	
	adlagency Director/chair/Commit	
	committee leader head team	
	chairman head committee	
minister head committee leader he	ad committee president l	
chairmanlru	un committee director head team	
The state of the s	representative chair committee /	
preside	ntlheadlcommittee	officer chair committee
director head	committee Director head	team
	Officer chair Committee	
renre	sentativelheadlcommittee	

Triframes frame induction

Require: an embedding model $v \in V \rightarrow \vec{v} \in \mathbb{R}^d$,

Require: a set of SVO triples $T \subseteq V^3$,

Require: the number of nearest neighbors $k \in \mathbb{N}$,

Require: a graph clustering algorithm **CLUSTER**.

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Triframes frame induction

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Require: the number of nearest neighbors k \in \mathbb{N},
Require: a graph clustering algorithm CLUSTER.
Ensure: a set of triframes F.
   S \leftarrow \{t \rightarrow \vec{t} \in \mathbb{R}^{3d} : t \in T\}
   E \leftarrow \{(t, t') \in T^2 : t' \in \mathrm{NN}_{k}^{\mathsf{S}}(\vec{t}), t \neq t'\}
   F \leftarrow \emptyset
   for all C \in CLUSTER(T, E) do
      f_{s} \leftarrow \{s \in V : (s, v, o) \in C\}
      f_{v} \leftarrow \{v \in V : (s, v, o) \in C\}
      f_o \leftarrow \{o \in V : (s, v, o) \in C\}
       F \leftarrow F \cup \{(f_s, f_v, f_o)\}
   return F
```



Example of an extracted frame

Frame # 848		
Subjects:	Company, firm, company	
Verbs:	buy, supply, discharge, purchase, expect	
Objects:	book, supply, house, land, share, company, grain, which, item, product, ticket, work, this, equipment, House, it, film, water, something, she, what, service, plant, time	



Example of an extracted frame

Frame # 849			
Subjects:	student, scientist, we, pupil, member, company, man, nobody, you, they, US, group, it, people, Man, user, he		
Verbs:	do, test, perform, execute, conduct		
Objects:	experiment, test		



Example of an extracted frame

Frame # 3207		
Subjects:	people, we, they, you	
Verbs:	feel, seek, look, search	
Objects:	housing, inspiration, gold, witness, part- ner, accommodation, Partner	

Evaluation datasets

Dataset	# instances	# unique	# clusters
FrameNet Triples	99,744	94,170	383
Poly. Verb Classes	246	110	62

Induction of semantic frames

Evaluation settings

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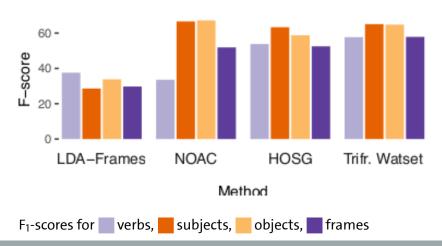
Quality Measures:

■ nmPU: normalized modified purity,

■ niPU: normalized inverse purity.



Results: comparison to state-of-art





Ustalov, D., Panchenko, A., Kutuzov, A., Biemann, C., & Ponzetto, S. P. (2018).

Unsupervised semantic frame induction using triclustering. *arXiv preprint arXiv:1805.04715*.