Frame Shift Prediction

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It is challenging to project annotations and bootstrap FrameNets because of **frame shifts** (i.e., frames evoked in parallel sentences are different). **How can we predict them?**

Main Contributions

- **Case study** of frame shifts
- Propose a new task called **Frame Shift Prediction (FSP)**
- Representing frames with **graph neural networks** help predict frame shifts.

Case Study of Frame Shifts

- Frame shifts emerge from **translational divergences** and **construal differences**.

Everybody has an interest in education .

interest.n

Experiencer | Emotion_directed | Topic

(All) (world) (self) (interest) (in)(education)

Todo mundo se interessa por educação .

interessar - se.v

Experiencer | Mental_stimulus_exp_focus | Topic

Categorial divergence

We think in sound .

sound.n

Sensation

Percept

(We think) (aurally)

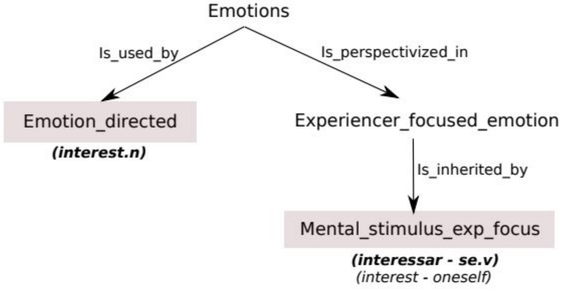
Pensamos auditivamente .

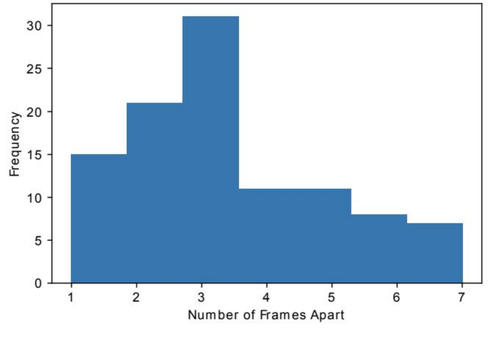
auditivamente.adv

Comparison _activity | Manner

Differences in prominence

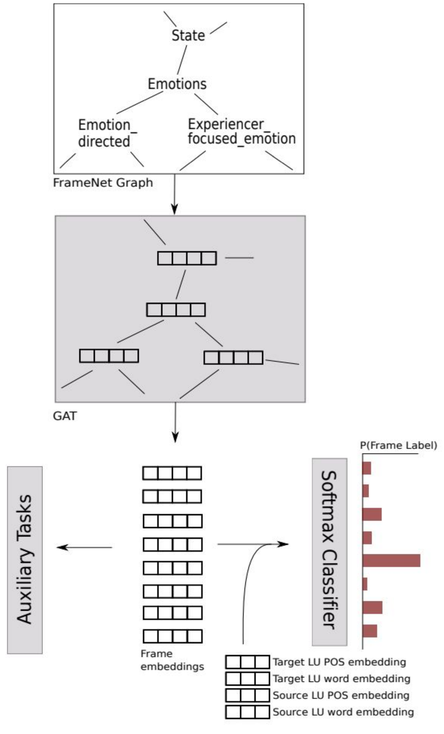
- In frame shifts, most frame pairs are **connected to each other.**





Proposed Approach

- Use GAT to represent frames.



- Auxiliary tasks to learn frames' connections and frame-LU relations

Tasks	Objective Functions
Frame Shift Prediction	Cross-Entropy Loss
Link Prediction	Cross-Entropy Loss
Path Length Prediction	Mean-Squared Error
Binary Frame Prediction	Cross-Entropy Loss
Frame Label Reconstructio	Cross-Entropy Loss

FSP and auxiliary tasks

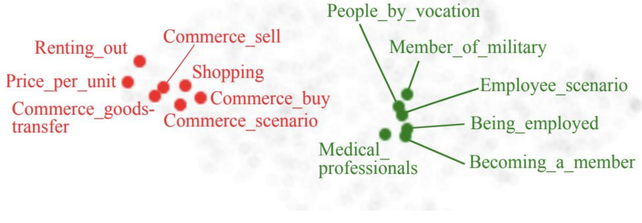
Experimental Settings

- **Languages**: EN–DE and EN–PT
- **Dataset Source**: Global FrameNet Shared Annotation Task (manually annotated TED Talk transcripts)
- **Metrics:** Top 5 F1-score

Data	# lus	# frames	# sents	langs	tasks
Semantic Frame Shift Prediction Dataset (Section 3.1)	952	179	788	de, en, pt	Frame Shift Prediction
Berkeley FrameNet 1.7 (Ruppenhofer et al., 2016)	8404	1224	174527	en	Link Prediction Path Length Prediction Binary Frame Prediction Frame Label Reconstruction
Multilingual frame-annotated corpus (Johannsen et al., 2015)	7558	729	18442	bg, da, de, el, en, es, fr, it, sv	Binary Frame Prediction Frame Label Reconstruction

Results

- Frame representation with **GAT + auxiliary training** has the best FSP performance.

Models	EN → PT	EN → DE	EN → (PT + DE)
Direct Transfer	77.5	63.9	74.3
Randomized Embeddings	44.2 (± 3.1)	37.7 (± 2.4)	39.8 (± 2.9)
Sikos and Padó (2018)	-	55.2 (± 3.5)	-
mBERT (w/o fine-tuning) (Sikos and Padó, 2019)	53.4 (± 1.7)	47.8 (± 4.3)	49.3 (± 2.4)
mBERT (with fine-tuning) (Sikos and Padó, 2019)	71.5 (± 2.3)	65.6 (± 0.9)	68.7 (± 2.2)
FastText (Baker and Lorenzi, 2020)	54.8 (± 1.1)	43.7 (± 2.6)	50.1 (± 1.8)
GAT (w/o auxiliary training)	57.1 (± 1.3)	40.2 (± 1.8)	55.9 (± 4.1)
GAT (with auxiliary training)	**83.1** (± 1.5)	**68.0** (± 1.9)	**79.7** (± 2.0)

- **Clusters** of connected frames or frames with shared domain.